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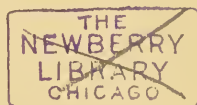
SEPULTURE.

SEPULTURE:

ITS

HISTORY, METHODS

AND



SANITARY REQUISITES.

BY

STEPHEN WICKES, A. M., M. D.,

Author of "History of Medicine and Medical Men of New Jersey," &c.

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SEPULTURE.

ITS METHODS AND REQUISITES.

BY STEPHEN WICKES, M. D.

INTRODUCTION.

The last few years have witnessed a growing popular interest upon the subject of bad air—*malaria*. Its effects are well known. Measures to correct it and thus promote the public health have been made the subject of study by intelligent observers of all classes. Boards of Health, National, State, and Municipal, are established. Wise sanitation is everywhere regarded as essential to the public good.

In the wide range of sanitary study and effort, the subject of *interment of the dead* has received a comparatively limited attention. A more generally extended and definite knowledge upon burial, and the dangers of animal putrescence is an imperative need.

With the design of diffusing information upon this important subject, the author has written the following treatise on *Sepulture and Mortuary Customs and their Requisites*. He first gives a concise historical survey of sepulture from the beginnings of history. He deemed it worthy of its place, because of its intrinsic interest,

INTRODUCTION.

but especially to show that, in this our day of light and of the knowledge of nature's laws, we are still cherishing in our methods of interment customs born and fostered in the dark ages.

The authorities consulted, which have been freely used in the compilation of facts and of the opinions of scientific observers, are :

Dangers of Interments in Cities, by Vicq. Dazyr.

Dangers of Interments by Felix Pascalis; Walker on Graveyards; Bascom on Ancients Epidemics; Health of Towns (magazine), London; Chadwick's Report to the English Parliament; Rauch on Intramural Interment; J. F. A. Adams on Cremation and Burial; Yarrow on Indian Burial; Parke's Practical Hygiene; Buck's Hygiene; Reports of Boards of Health, National, State and Local of the United States and of the Government Board of Great Britain; also authors, Biblical, historical, of travels, etc., etc.

Some of these were written early in the century, and are out of print. Being foreign they are rare in our public libraries. The author is indebted for the loan of such—the rarest and most valuable—to Dr. Jos. M. Toner, of Washington, D. C., who sent them to him unsolicited, for his use, and for which he returns his grateful acknowledgments, as also to his other friends, Doctors S. A. Green and James R. Chadwick, of Boston, and to many others for their valuable aid.

ORANGE, NEW JERSEY, May, 1883.

SEPULTURE.

ITS HISTORY.

"To bury a dead body, whether known before or not, is a debt I owe to humanity."—SENECA.

"Bury me with my fathers. * * * There they buried Abraham and Sarah, his wife; there they buried Isaac and Rebecca, his wife; and there I buried Leah."—GEN. xlix, 29-31.

These two extracts express the promptings of the universal human heart; one the reverent religious awe in the presence of death, the other an instinctive looking for immortality, which fosters the expectation of a reunion with loved ones gone before.

According to Josephus the first dead body was buried by Cain to cover his crime. The statement was derived from the traditions of the Rabbis, and cannot be accepted as reliable. The only shred of testimony upon the subject comes from the scripture record: "The voice of thy brother's blood crieth unto me from the ground." A distinguished Hebraist remarks upon this passage that the Hebrew preposition (from) does not decide whether the cry was from the surface or from beneath the ground, although the latter idea might have been made definite by the use of a compound preposition. The idea of Josephus cannot be got from the passage. The body of

Abel was not interred by his brother that it might be "buried from (his) sight." Being the first human *cadaver* after the Creation, Cain did not know of its subsequent corruption.

Inhumation was practised from the earliest times. The dead were buried in the wilderness, and in places inhabited. Abraham, who was a "mighty prince," upon the death of Sarah, "stood up before his dead and spake unto the sons of Heth * * * give me a possession of a burying place with you that I may bury my dead* out of my sight." He thereupon purchased the cave of Machpelah for money.

Jacob's remains were transported from Egypt by his son Joseph with great pomp, and laid in Canaan, according to his desire made known before his death. Moses was buried in the valley of Moab, Miriam, his sister, in the desert of Zin, Aaron in Mount Hor, Eleazer, his son, and Joshua, on the mountains of Ephraim. The bones of Joseph, which the children of Israel brought up out of Egypt, were buried in Shechem in a parcel of ground which Jacob had bought, three hundred years before, of the sons of Hamor, and where he erected an altar to Jehovah.

After the Israelites came into the quiet possession of the promised land and were brought under the requirements of their ceremonial laws, their habits in regard to

* Not Sarah in particular, but those of his posterity, being assured of their promised possession.

the dead and their methods of sepulture were somewhat changed. According to the precepts of their law, the touch of a corpse rendered them unclean.

After the flood, the diseases which afflicted the human race were substantially the same as at the present day.* Epidemics of infection and contagion and pestilential influences were prevalent then as now, the evils arising from improper food and drink, from bad air in the dwellings of the people, and neglect of proper hygienic measures required a watchful care. The Mosaic statutes regarding things clean and unclean, though primarily typical, were wisely ordained by God for the best welfare of his chosen people. His precepts in the ceremonial law were designed to preserve their health and to regulate their moral life.

* "The records of antiquity show that all kinds of pestilences, including febrile diseases under various appellations, have been known from the earliest ages. From the beginning of the Jewish nation—from the first settlement of the Israelites in unhealthy Egypt to the present day, we find noticed a series of plagues or pestilences spread over the world and destroying millions of the species; and if we refer to the history of ancient nations, as well as to the modern annals of medicine, we shall find therein recorded the same character of diseases, arising from like causes, occurring in similar seasons, happening in similar localities, and marked pretty generally by the same circumstances. The assumption of the existence of any new disease, as propounded by some modern authorities, would represent the Divine Power as dispensing with the laws of nature—in short, would imply nothing less than the suspension or alteration of the operation of those laws which the Almighty, in His wisdom, imposed on nature at the Creation—laws which the Psalmist of Israel, in his contemplation of the divine goodness and greatness of Jehovah, as displayed in the kingdom of nature, describes as the admirable chain of natural causes and effects formed and preserved by him in this lower world: 'Whatsoever the Lord pleaseth He doeth in heaven and in the earth, in the sea and in all deep places. He causeth the vapors to ascend from the earth; He maketh the lightnings for the rains; He bringeth the wind out of his treasure; He smote the first-born of Egypt, from man to

The Hebrews were very careful in the burial of their dead. It was considered to be a great calamity to be deprived of it, and denied it to none—not even their enemies. This concern for burial proceeded from a persuasion of the soul's immortality. Jeremiah (viii, 2) threatens the kings, priests and false prophets, who were idolators, that their bones should be cast out of their graves and be thrown like dung upon the earth. The same prophet foretold that Jehoiakim, King of Judah, who was guilty of all manner of vice, among other severe punishments, should be buried with "the burial of an ass." Jason (2 Macc. v : 10), who had denied burial to many

beast ; He covereth the heavens with clouds ; He prepareth the rain for the earth,' etc.

" The supposition of the existence of any new disease is, consequently, untenable, but to be accounted for because of our inability to trace diseases under the same names and precise characteristic symptoms described by our predecessors. The supposed comparative modern origin of some diseases seems to rest on the absence or deficiency of distinct and express notice of them in the writings of the ancients, arising in some measure from the false and imperfect translations from the original, and from the practice of the ancients in referring different malignant maladies to the same pestilential constitution. They classed all epidemic distempers under one general head or term, viz. : pestilence, plague or fever. Under the head of consumption, they noted all chronic diseases ; and boils, pustules, blotches, carbuncles, etc., under that of skin diseases. Thus we read of the same epidemics called pimples, pustules, apostemes and gangrenous sores now being called distinct and confluent small-pox, etc. The perusal of ancient writings, both sacred and profane, not only affords ample evidence of the origin, nature, causes, progress and violence of such maladies in the primitive ages of the world but they demonstrate the identity of ancient pestilence and modern plague ; the resemblance of ancient and modern fevers ; the similitude of burning boils and modern carbuncles ; the like appearance of pustules and small-pox—all tending to prove that no material alteration in the nature of any diseases or their causes has taken place since the first population of the world, and, above all, that they display the perpetual uniformity of Providence in the entire operation of nature's works."—*Bascom on Ancient Epidemics.*

Jews, was himself treated in the same manner. He died in a foreign land, and was thrown like carrion upon the earth. Good men made it a part of their religious devotion to inter the dead, as appears in the history of Tobit.

Calmet.

It was a maxim not only with the Jews but with all the nations of the world, that holy places are polluted by the presence of dead carcasses or of dead men's bones. When King Josiah desired to profane the altars dedicated to idols, he burned dead men's bones upon them, which he took from the sepulchres on the Mount. When God threatened by Ezekiel to punish Israel He told them that their altars should be desolate, and "I will lay the dead carcasses of the children of Israel before their idols; and I will scatter your bones about your altars."

After the Jews were settled in Canaan, they buried their dead in various places. Their law made no provision for the mode or place of interment. Sepulchres were in the towns and country, by the highways, in gardens and on mountains. Those belonging to the Kings of Judah were in Jerusalem, and in the Kings' gardens.*

* Extract from Dr. Jowett's *Christian Researches in Syria*: "While walking out one evening a few fields distant from Deir el Kamr with the son of my host to see a detached garden belonging to his father, he pointed out to me, near it, a small, solid, stone building, apparently a house, very solemnly adding, '*Kabbar beity—the sepulchre of my family.*' It had neither door nor window. He then directed my attention to a considerable number of similar buildings at a distance which, to the eye, are exactly like houses, but which are in fact family mansions for the dead. They have a most melancholy appearance, which made him shudder while he explained their use. They seem by their dead walls, which must be opened at each several interment of the members of a family, to say :

Ezekiel intimates that they were dug under the mountain upon which the temple stood, as God says, that in future his holy mountain should not be polluted with the dead bodies of their kings. The sepulchre which Joseph of Arimathea provided for himself was in his garden; that of Rachael was adjacent to the highway from Jerusalem to Bethlehem; that of the Maccabees was at Modin; the Kings of Israel were buried in Samaria: Samuel, in his own house; Moses, Aaron, Eleazer and Joshua in the mountains; Saul and Deborah (Rebecca's nurse), under the shade of trees. The sepulchres of the inhabitants of Jerusalem are supposed to have been in the valley of Kidron.—*Calmet*.

ANCIENT CUSTOMS AND METHODS OF BURIAL.

The Egyptians embalmed their dead.* Joseph com-

'This is an unkindly house, to which visitors do not willingly throng; but, one by one they will be forced to enter, and none who enter ever come out again.' Perhaps this custom which prevails here and in the lonely neighboring parts of the mountains may have been of great antiquity, and may serve to explain some scripture phrases. The prophet Samuel was buried 'in his house at Ramah.' It could hardly be in his dwelling house. Joab 'was buried in his own house in the wilderness.' This was the 'house appointed for all living.' Carpzov remarks: 'It is hardly to be supposed that the sepulchres were in the houses themselves and under the roof; and we are therefore rather to understand by the term, everything which belongs or appertains to the house—as a court or garden, in a corner of which perhaps such a monument was erected.' The view of these sepulchral houses puts the matter beyond conjecture."

* The art of embalming was brought to the highest degree of perfection by the ancient Egyptians. The process was conducted by skilled men who, as Herodotus informs us, made it their proper business. This historian says that three modes were employed. By the first and most perfect, the brain was drawn through the nostrils by a crooked piece of iron, which dislodged the most consid-

manded that his father's body should be embalmed. Joseph's body was also embalmed in Egypt.

The Hebrew people were buried in sepulchres, or in graves in the open fields. Elijah was laid in a grotto where other bodies were placed. A grave was dug for

erable portion of the contents of the skull, and then the same was cleared by rinsing with drugs. Next a cut was made along the flank with a sharp Ethiopian stone (black flint or Ethiopian agate), through which the viscera of the body were removed. The cavities of the thorax and abdomen were then cleansed with palm wine and by frequent infusions of pounded aromatics. They were then filled with the purest bruised myrrh, cassia, and every sort of spicery, except frankincense, which was devoted to sacred uses in their temples. The "spicery, and balm, and myrrh" carried by the Ishmaelites down to Egypt, were principally for the embalmers (Gen. xxxvii, 25-28). The spice merchants are noticed in Solomon's time (1 Kings, x, 15.)

When this initial process was completed the incision was sewed up and the body was placed in natrum (not nitre, but sub-carbonate of soda, which was abundant at the natron lakes in the Lybian desert.—*Rawlinson's Notes*) for seventy days and covered entirely over. After the expiration of this time, which must not be exceeded, the body was washed and swathed from head to foot with bandages of fine linen cloth coated with gum, and then delivered to the friends, who enclosed it in a case shaped according to the human figure. It was then placed in a sepulchral chamber upright against the wall.

The second process, and less costly, was by syringing the cavities through the natural openings of the body with an oil made from the cedar tree. The passages by which it might escape were stopped and the body laid in natrum for the prescribed number of days. At the end of the time the cedar oil was allowed to escape, "and such is the power, that it brings with it the whole stomach and intestines in a liquid state. The natrum has in the meantime dissolved the flesh, and so nothing is left of the dead body but the skin and bones."

The third method employed in the case of the poorer classes was to clear out the intestines by a "powerful cleansing preparation," and let the body lie in natrum the seventy days, after which it was given to the friends. *Herodotus*, Book II, §85, sqq.

The historian includes in the seventy days the whole period of mourning. The embalming occupies only forty days. Gen. i, 3 (*Rawlinson*).

Diodorus Siculus says "the most expensive mode of embalment cost a talent of silver (£250, nearly); the second, 22 minœ (£90); and the third was very cheap.

The Egyptian mummies as we find them, show a much greater variety in the methods of embalming than those noticed by Herodotus and Diodorus, and the prices doubtless varied accordingly. (*Rawlinson*).

young Tobias in the same field where the other unfortunate husbands of Sarah were deposited. Our Saviour compares the Pharisees to "graves that appear not, so that the men that walk over them are not aware of them." In the case of those who died of leprosy, the tumuli of the graves, or other evidences of the dead beneath, were avoided, lest uncleanness should be contracted.

A few passages of scripture refer to burning of the dead. The cases are exceptional. Saul was buried at Jabesh Gilead. "David carried thence his remains or bones, which had been reduced to ashes by the people, to the land of Benjamin" (2 Sam., xxi, 12). The ceremony of burning* of the body is spoken of as a rite in honor of kings. If the practice did exist it was of short duration and limited to a few.

Excepting the cases of Jacob and Joseph, whose bodies were embalmed as a mark of distinguished honor, at the expense of the state, we have no distinct account of embalment among the earlier Hebrews. In later times the Jews adopted it in the case of persons of rank and fortune.†

After the ablution of the corpse the body was swathed with numerous folds of linen, or other stuffs, each limb‡

* According to Spondanus, the Hebrews burned perfumes upon their dead. It was called *combustio*, from which he says it was wrongly concluded that they burned their bodies also.

† Scripture mentions the embalming of Kings Josiah and Asa, and of our Saviour.

‡ The mummies of the Greeks may be generally distinguished by the limbs being each bandaged separately.—*Rawlinson's Notes*.

separately after the manner of the Greeks, and then anointed with highly aromatic unguents.* A profuse application of costly perfumes was esteemed to be the highest token of respect which could be paid to the remains of the departed. We learn from the writers of the Talmud that not less than eighty pounds weight of spices were used at the funeral of a distinguished Rabbi, and Josephus says (Antiq. xvii, 8, § 3) that in the funeral procession of Herod, five hundred slaves and freedmen of the court attended, carrying spices. Thus we read that Nicodemus brought a mixture of myrrh and aloes, about an hundred pounds weight, to perform the customary rite to the body of Jesus. The two Marys also prepared themselves to render the same tokens of affection at the dawn of the first day of the week.

It was usual to repeat this process for several days together, that thereby the drugs and spices might more completely effect the exsiccation and preservation of the body. It was then swathed, as before described. So we read that Joseph of Arimathea and Nicodemus "took the body of Jesus and wrapped it in linen clothes with the spices, as the manner of the Jews is to bury." When Lazarus was raised it is recorded that the dead came forth bound hand and foot in grave clothes. About his face was

* This was a rite common both to the Greeks and Romans, in whose writings it is frequently mentioned—*Corpusque lavant frigentis et unguent.*—Æneid, b. vi, 219. "For in that she hath poured this ointment on my body she did it for my burial—*pros to entaphiasai me*—to embalm me—dispose it for the sepulchre,

folded a napkin,—a separate covering, and not continuous with the bandages. We read that when our Lord was risen, Peter, who went into the sepulchre, saw the linen clothes—*keimena*—lying in *situ*, as deposited by the embalmers—alone and separate from the napkin, which was—*entetuligmenon*—wreathed in folds to form a cap for the the head.

When Lazarus was raised, Jesus said: “Loose him and let him go.” His own body, probably more carefully bound, was not holden by its swathings. He supernaturally passed out of them, leaving them without disturbing their order.

SEPULCHRES.

The holy sentiments which prompted a reverential care of the dead led to the provision in all past time of places of deposit of the most permanent nature, constructed with all the art and skill of their various periods and according to the wealth of their founders. Abraham, who was “rich” and mighty, raised a memorial to his dead in Hebron, which was doubtless in correspondence with his riches and station. That it was a spacious cave appears from the numbers who, we learn from scripture history, were buried there. The references to *sepulchres well peopled* are very numerous. The prophet Ezekiel, in chapter xxxii, seems to distinguish certain nations and countries by their mode of burial. We recognize Ashur or Assyria, Elām or Persia, Mechech and Tubal, Muscovy

and Siberia, Edom and Zidon, and the countries adjacent. Of the Assyrian sepulchres we know but little, yet the prophet speaks of the "sides of the pit" (the cells or recesses in those sides), as being inhabited. From the sepulchres of the kings, yet extant in Egypt we know that the sovereigns were buried together, many sepulchres encircling the area, and several chambers in one sepulchre. In Persia the evidences of sepulchres cut in the rocks are yet remaining. Not so (probably) Mechech and Tubal. They threw up vast barrows over their valiant leaders, their followers sharing in the same highly raised mound. Their weapons and military ornaments were buried with them. Their swords are to this day found under the heads of their skeletons. The numerous barrows in the steppes of Russia are evidences on this subject, and the phrase "iniquities shall lie heavy on their bones," is an allusion to the weight of earth under which they are deposited. The princes of the north of Syria and of Asia Minor have left wonderful proofs of their skill in excavating rocks, of which recent discoveries afford attestation. The *cryptæ* at Latikea or Laodicea, in the northern part of Syria, and of Asia Minor, are sepulchral chambers hollowed in the rocky ground, some ten, others twenty or thirty feet square, but not proportionate in height. The descent into them is artfully contrived. A range of narrow cells, wide enough for two or three, runs along the sides of most of them, and appears to be the only provision that has been made for the "

reception of the dead. The sepulchral chambers near Jebilee Tortosa and the Serpent Mountain, together with those commonly called the royal sepulchres at Jerusalem, are all exactly of the same workmanship and contrivance with the *cryptæ* at Latikea. *Calmet*.

In Edom, the land of Esau, the traveler Stephens describes the tombs at Petra, whose open doors stretch away in long ranges, the facades and architectural decorations of which were "everywhere handsome."

Dr. Clarke discovered and has fully described a number of sepulchres which extend along the side of the ravine to the south, east and west of Mount Sion. They are a series of chambers hewn with considerable art, each containing one or more repositories of the dead, like cisterns carved in the rock, upon the sides of the chambers. The doors are so low that to look into any one of them it is necessary to stoop, and, in some instances, to creep on the hands and knees.* *Vid. Luke xxiv : 12.*

Stephens, in describing the tombs of the Kings of Egypt at Thebes, says "the world can show nothing like them." Forty-seven of these tombs were entered on the sacred registers of the Egyptian priests, only seventeen

* Stephens, describing the valley of Jehosophat, says: "Here I was among the hallowed places of the Bible. Here, all was as nature left it, and spared by the desecrating hand of man; and, as I gazed upon the vast sepulchral monuments—the tombs of Absalom, of Zachariah and Jehosophat, and the thousands and tens of thousands of Hebrew tombstones covering the declivity of the mountain—I had no doubt that I was looking upon that great gathering place where, three thousand years ago, the Jew buried his dead under the shadow of the Temple of Solomon,"

of which remained about sixty years before Christ. He describes one discovered by Belzoni. Its entrance is by a narrow door—a simple excavation in the side of the mountain, without device or ornament. It is 309 feet long, and contains fourteen chambers of different sizes. The entrance hall is extremely beautiful, 27 feet long and 25 broad, the walls covered with figures in outline, but perfect, as if recently done. Descending a large staircase and through a beautiful corridor, the visitor came to another staircase, at the foot of which he found another apartment, 24x13, and ornamented with sculpture and paintings. The sides of all the chambers and corridors are thus covered, the colors appearing fresher as the visitor advances towards the interior of the tomb; figures of Egyptian gods and goddesses, seeming to hover round and guard the remains of the honored dead. Further on is a large hall, 28 feet by 27, supported by two rows of pillars; and beyond this is the entry to a large saloon, with a vaulted roof 32 feet by 27. Opening from this were several other chambers of different dimensions, one of them unfinished, and one 43 feet long by 17.6 wide, in which was found a mummy of a bull; but in the centre of the grand saloon was a sarcophagus of the finest oriental alabaster, only two inches thick, minutely sculptured within and without with several hundred figures, and perfectly transparent when a light is placed within it. All over the corridors and chambers the walls are adorned with sculptures and paintings in intaglio and relief,

representing gods, goddesses and the hero of the tomb (supposed to be Pharoah Necho) in the most prominent events of his life, priests, religious processions and sacrifices, boats and agricultural scenes, and the most familiar pictures of every-day life, in colors as fresh as if painted not more than a month ago ; and the large saloon, lighted up with the blaze of torches, seemed more fitted for a banqueting hall for song and dance than a burial place for the dead. " At different times," says our traveler, " I wandered among all these tombs. All were of the same general character, all possessed the same beauty and magnificence of design and finish, and, in all at the extreme end, was a large saloon adorned with sculpture and paintings in extraordinary beauty, and containing a sarcophagus. Every sarcophagus is broken, and the bones of the Kings of Egypt are scattered. In one I picked up a skull. I mused over it a moment and handed it to Paul (his attendant), who moralized at large : ' That man,' said he, ' once talked and laughed and sang and danced, and ate macaroni.' ' The kings of the nations did lie in glory, every one in his own house, but thou art cast out of thy grave like an abominable branch.' " *

* The sepulchral chamber was not in the houses of the Egyptians. Herodotus says it was in a room made for the purpose, which was a part of the tomb.

In the floor of this chamber a pit was sunk, often to the depth of forty feet or more, where, after certain services performed, the embalmed body (mummy) was deposited. Tombs less expensive were without a room, but only the pit, which was the proper place of sepulture. The name " tomb " is applied to the apartment above the pit. The coffin or mummy case was placed at the bottom, or in a lateral chamber or recess in " the sides of the pit."—*Rawlinson's Notes.*

The same traveler says that notwithstanding the vast numbers of mummies which have been taken and scattered over the world, and the mummy cases used for firewood by the Arabs, it is supposed that there are still (at the time of his writing) from eight to ten millions of mummied bodies in Thebes. The whole mountain side on the west bank of the river is one vast necropolis. The open doors of tombs are seen in long ranges and at different elevations, and on the plains pits have been opened in which have been found a thousand mummies at a time. It has been estimated that 400,000,000 human mummies were made in Egypt from the beginning of the art of embalming until its discontinuance in the seventh century.

INTERMENT AMONG THE GREEKS.

The most ancient custom with the Greeks was burial. It is supposed that their subsequent usage of burning was introduced at the seige of Troy,* when the great

* Homer describes the ceremonies of the funeral pyre of the Greek hero slain by Hector :

“ Permit the mourning legions to retire,
And let the chiefs alone attend the pyre ;
The pious care be ours the dead to burn
He said ; the people to their tents return,
While those deputed to inter the slain
Heap with a rising pyramid the place.
A hundred feet in length, a hundred wide,
The growing structure spreads on every side ;
High on the top the manly corse they lay,
And well-fed sheep and sable oxen slay.
Achilles covered with their fat the dead
And the pil'd victims round the body spread ;

slaughter and the example of the Phrygians determined them to consume the bodies of the slain as the readiest mode of disposing of them. The ashes of the heads of the nations and of the generals who had served their country were distinguished by being placed in urns and deposited in houses set apart for them, and sometimes in their temples, but these instances were rare. Interments were more generally used in Greece than elsewhere, and always without the walls of their cities. Burning was by no means the general custom, but was regarded as more honorable, and was used among the higher classes. Plato wrote to Socrates that it was a matter of indifference to him whether his body was buried or burned. It was a

Then jars of honey and of fragrant oil,
Suspend around, low bending o'er the pile.
Four sprightly coursers with a deadly groan
Pour forth their lives and on the pyre are thrown.
Of nine large dogs, domestic at his board,
Fall two, selected to attend their lord.
Then last of all, and horrible to tell,
Sad sacrifice, twelve Trojan captives fell.
On these the rage of fire victorious preys,
Involves and joins them in one common blaze."

As the pile no longer blazed, Achilles addressed the Grecians thronged around him :

"Ye kings and princes of the Achaian name!
First let us quench the yet remaining flame
With sable wine ; then (as the rites direct)
The hero's bones with careful view select ;
(Apart and easy to be known they lie
Amidst the heap, and obvious to the eye :
The rest around the margin will be seen
Promiscuous, steeds and immolated men.)
These, wrapped in double cawls of fat, prepare ;
And in the golden vase dispose with care,
There let them rest, with decent honor laid,"

—*Iliad*, b. xxii.

special provision in the codes of the most famous legislators.*

Cæcrops at Athens directed that the dead should be carried without the walls. Solon established the same regulations. The few who were buried within the walls were heroes and those who had sacrificed themselves for their country. Plato did not allow interments in the fields used for culture. Their religion gave sanction to the custom, though no nation was more solicitous to give their dead the honors of sepulture. Those who violated the tombs were regarded as victims irrecoverably given over to the wrath of the gods. "The sanctity of tombs, (many of which became the temples of their divinities and were considered as asylums for the unfortunate and accused) the respect which they bore for the ashes and the memory of their ancestors, the penalties with which the laws of religion menaced the violators of those customs, the curses denounced against them by the priests, in a word, the whole religious doctrine, and the mythology of the Greeks had in view the enforcement of the laws for the interment of the dead at a distance from the habitations of the living."† *Vicq. Dazyr.*

* Lycurgus was the only one who permitted burials in cities, in temples, and in public places. His purpose was to arouse the youth of Sparta to bravery and courage by familiarizing with the idea of death.

† Cicero, in one of his epistles, in which he describes the assassination of his friend, M. Marcellus, at Athens, says that he had not been able to obtain permission of the Athenians that the body should be buried in the city. They said that such permission was inadmissible on religious grounds, and that it had never been granted to any one.

CUSTOMS OF THE ROMANS.

The Romans in their earlier days practised interment. Vicq. Dazyr says that after their settlement in Italy they constructed tombs at their country places, and placed in them the bodies in vases large enough to enclose them. Numa's tomb was on Mt. Janiculum, which was not then included within the city. The succeeding Kings had tombs in the field of Mars, situated below the city and the Tiber. The Kings of Rome alone had the privilege of being buried on that mount. No private person could be placed there unless distinguished by some worthy action. The vestals were permitted burial within the city walls. Those who had broken the vow of chastity were buried in a field to which that sin had given the name of the "field of crime." It seemed to be an accepted fact that interment of the dead within the city and inhabited places was dangerous to the living, and the places of burial were removed to some distance. The law of the twelve tables expressly forbade the burning or burying of the dead within the city.

By the terms of that law it appears that from the 4th century of the republic, burning and burial were both practised. The outrages to the buried bones exposed to the barbarians in war, and their religious sentiments, led them to favor burning and to bring the funeral pile more and more into use.*

* The "pile was of rough logs, with four equal sides, of which the law of the twelve tables forbade any polishing or adornment, but they were some-

The law appointed the open country for funeral rites and inhumations. The practice of these ceremonies was scarcely permitted contiguous to the suburbs of the city. It was ordained that the dead should be respected. "Their sanctuary was thus rendered inviolable and their sepulture sacred. In whatsoever place the dead was interred, all the ground which surrounded it was withdrawn from the purposes of trade or commerce." In the course of time tombs ceased to be constructed at the country seats, and those of the most illustrious families were transported to the highways. Thus the great roads and avenues were named the Aurelian, Flaminian, Lucinian, Appian, Lavinian and Julian *way*, after the families whose superb mausoleums and sarcophagi of marble adorned them.

The common people among the Romans had also their funeral piles and public tombs. *Hoc miseræ plebi, stabat commune sepulchrum.—Hor.* Such were the small wells

times covered with dark leaves. The body was placed upon the pile, with the couch upon which it had been carried. The nearest relative, with averted face, applied the torch, and the flames were fed with cups of oil, ornaments, clothing, and the favorite viands of the deceased. To these were added various perfumes, which, though forbidden by law, were rendered necessary by the disgusting odor. In the case of an Emperor or illustrious General, there was much additional ceremony. Animals were killed and laid on the pile, and in earlier times, captives and slaves. The soldiers marched thrice around the pile. In the latter days of Rome gladiators were hired to fight about it. When the burning was completed, the embers were soaked with wine. The bones and ashes of the deceased were then gathered by the nearest relatives, who sprinkled them with perfume and placed them in an urn. These urns were often very beautiful and richly decorated; they were commonly of marble, alabaster or baked clay, and bore an inscription beginning with the letters D. M. or D. M. S.—*Dis Manibus Sacrum*,"—*Adams*.

(*puteoli*) or deep cavities into which the dead bodies were cast. The places where the bodies were burned were called *ustrinæ* or public funeral piles. The small wells were on the Hill Esquiline. The neighborhood of the Esquiline becoming infected by the great numbers of the buried dead, it was abandoned and became, history says, afterwards the possession of Mæcenæ. There he had his tomb, as also Horace, his friend, whose remains repose near him.

“From all these laws, customs and usages of the Romans, in relation to their modes of burial, which, with few exceptions, continued in force until the reign of the Cæsars, it is evident that the immense City of Rome was better protected against the recurrence of epidemic diseases than many of our own capital cities.” *Pascalis*.

PERSIAN BURIAL.

The ancient Persians threw out their dead on the roads. If they were promptly devoured by the wild beasts it was esteemed a great honor; a misfortune, if not. They believed that they must have been very bad if even the beasts would not touch them. The relations of the dead took it as a presage of some great misfortune which was imminent, and that the souls which had inhabited the bodies, being dragged down to hell, would not fail to return and trouble them.

The Parthians, Medes, Iberians and Caspians had such a horror of the corruption and decomposition of the dead, and of their being eaten by worms, that they threw

the bodies into the open fields to be devoured by wild beasts, believing that those so devoured would not be entirely extinct, but enjoy a partial life in their living sepulchres. *Yarrow on Mortuary Customs.*

The "Towers of Silence" show to this day the custom of the Parsees, in the exposure of their dead to birds of prey. This people are descendants of the ancient Persians—the fire worshippers, in Persia; called Parsees in India. Prof. Monier Williams writes from Calcutta, 1876, concerning these Towers of Silence, which are erected in a garden, approached by a well-constructed private road and barred by strong, iron gates. "No English nobleman's garden could be better kept, and no pen can do justice to the glories of its flowering shrubs, cypresses and palms. It seemed the very ideal, not only of a place of sacred silence, but of peaceful rest." The towers are five in number, of black granite, and constructed with great solidity. The oldest was built 200 years since, and is the smallest, being only used for a certain family. The next oldest was erected in 1756, the others, later. The writer says: "Though wholly destitute of ornament and even the simplest moldings, the parapet of each tower possesses an extraordinary coping, which instantly attracts and fascinates the gaze. It is a coping formed, not of dead stone, but of living vultures. These birds, on the occasion of my visit, had settled themselves, side by side, in perfect order and in a complete circle around

the parapets of the towers, with their heads pointing inwards ; and so lazily did they sit there, and so motionless was their whole mien, that, except for their color, they might have been carved out of the stone work."

He describes one of the towers as a round column or massive cylinder, twelve or fourteen feet high, and at least forty feet in diameter, built of solid stone, except in the centre, where a well five or six feet across leads down to an excavation under masonry, with four drains at right angles to each other, terminated by holes filled with charcoal. Round this solid cylinder is the stone parapet, ten or twelve feet high, which conceals from view the interior. The upper surface of the solid stone work is divided into seventy-two compartments, or open receptacles, radiating like the spokes of a wheel from the central well, and arranged in three concentric rings, separated by narrow ridges of stone, grooved to act as channels for conveying all moisture from the receptacles into the well, and thus to the lower drains. Each circle of the open compartments is divided from the next by a pathway, making three circular pathways, and these crossed by another conducting from the exterior door which admits the corpse bearer. We give his description of a burial. He says that while he was engaged in examining the work, "a sudden stir among the vultures made us raise our heads. At least a hundred birds, collected around one of the towers, began to show symptoms of excitement, while others swooped down from the neighboring trees.

* * * A funeral was seen to be approaching.

* * * The body, swathed in a white sheet, is placed in a curved, metal trough, open at both ends, and the corpse bearers, dressed in pure white garments, proceed with it towards the towers. * * * The funeral I witnessed was that of a child. When the two corpse bearers reached the path leading by a steep incline to the door of the tower, the mourners, about eight in number, turned back and entered one of the prayer houses.

* * * The two bearers speedily unlocked the door, reverently conveyed the body of the child into the interior, and, unseen by anyone, laid it uncovered in one of the open receptacles nearest the central well. In two minutes they reappeared with the empty bier and white cloth, and scarcely had they closed the door, when a dozen vultures swooped down upon the body and were rapidly followed by others. In five minutes more the satiated birds fly back and lazily settle down again on the parapet. They had left nothing behind but a skeleton."

The Parsees declare that they have adopted this mode of burial in obedience to the teachings of their prophet Zoroaster (who is supposed to have lived about the time of the fall of Babylon, B. C. 536). He taught that the elements were symbols of the Deity; that earth, fire and water ought never to be defiled by contact with putrifying flesh. Naked we came into the world, and naked we ought to leave it; that the decaying particles of our bodies should be dissipated as rapidly as possible, and in

such a way that neither mother earth nor the beings she supports should be contaminated in the slightest degree. They thus build their towers on the top of hills above all human habitation—not that their dead should be consumed by vultures, but dissipated in the speediest possible manner, and without the possibility of polluting the earth or contaminating a single being dwelling thereon. God sends the vultures, they say; but these do their work more expeditiously than millions of insects would do if the bodies were buried in the ground. Even the rain water which washes the skeletons is conducted by channels into purifying charcoal.

The towers which have been described contain the bones of all the Parsees who have died in Bombay for the last two hundred years. *Yarrow.*

NORTH AMERICAN INDIAN BURIAL.

The Indians of North America are descended from very ancient races. The ruins of constructions in South America date within 500 years of the foundation of Babylon. Fragments of early history, the relics of constructions and ethnological characteristics lead to the conviction that the earliest nations in America were from different divisions of the Japhetic and Semitic races. The ruins in Central America, as described by the traveler, Stephens, with accurate representations, testify to the antiquity of the ancient nations of that part of the continent, and their identity with the old nations of Egypt,

Persia and Phœnicia. The great mounds of the West, particularly those of Ohio, are of very great antiquity, and demonstrate that they were constructed in a period when the population was more vast than it has been at any period of time since.

Doctor H. C. Yarrow, in his contribution to the Bureau of Ethnology, Smithsonian Institution, classifies the modes of burial among the North American Indians as follows :

1st. By *Inhumation*.—This is the most common mode of interment. The simplest form, as noted by Schoolcraft, was that adopted by the Mohawks, of New York. They made a large round hole in which the body was placed either upright or on its haunches. They covered the grave with timber and raised over it the earth in a round mound. The Carolina tribes first placed the corpse in a cane hurdle or coffin, and after the funeral rites were celebrated it was placed in its sepulchre. The bottom of the grave is covered with two or three layers of bark, and over the bodies layers of bark many times double, and earth thereon well beaten down; the body lies in a vault, nothing touching it.

The Sacs and Foxes of Nebraska are careful to prevent the earth coming in contact with the body. They formerly put bark in the bottom of the graves, before the bodies were deposited in them, and timber or sawed plank over them. The corpse was always enveloped in a blanket, and the head placed to the east. They now employ

coffins rudely constructed. The Creeks and Seminoles of Florida bury about four feet deep in a round hole directly under the cabin or rock wherever the dead one had lived. The body is placed in a sitting posture. The grave is then covered with canes, and over them a firm layer of clay. The Pimas of Arizona tie the bodies of the dead with ropes, passing the latter around the neck and under the knees, and then drawing them tight until the body is doubled up and forced into a sitting posture. The graves are from four to five feet deep, round, and about two feet in diameter. They then hollow out to one side of the bottom a vault large enough to contain the body. The grave is then filled up level with the ground. The Comanches wrap the body in a blanket, bind it tightly with cords into a round, compact form, and then literally tumble it into an excavation selected for the purpose, usually a deep wash or head of cañon, in which their country abounds.

The Pueblo Indians of New Mexico, who, next to the Choctaws and Cherokees, are the most civilized of our tribes, bury in graves six feet deep, seven feet long and two wide. When filled up the ground is leveled and no mound is left to mark the spot. The corpse is baled up in a large, well-tanned buffalo robe, and tied around tight with a rope or lasso made for the purpose.

There are burying grounds in Tennessee, Kentucky, Illinois, and also in Central America, with regular graves. They are from twelve to eighteen inches deep, with slabs

of stone on the bottom, ends and sides. When the corpse is placed, in some horizontal, in others, in a sitting posture, it was covered with earth, with or without top slabs. In Tennessee the burial places or cemeteries are exceedingly abundant throughout the State. Often hundreds of graves may be found on a single hillside. Scattered graves and mounds are also found, the latter composed of a large number of cyst graves. With men, pipes, stone-hammers, knives, arrow heads, &c., are usually found. With women, pottery, rude beads, shells, &c. With children, toys of pottery, beads, curious pebbles, &c. *Major I. W. Powell.*

In the graves of all these tribes various articles are found.

The mounds so common in our Western States are depositories of the dead in the earth.

Burials beneath the house where the deceased died is common in some tribes. When it occurs, except in the case of the burial of children, the house is usually vacated and another home constructed.

Natural or artificial holes in the ground, and fissures in the rocks have been used as places of deposit for the dead from the earliest times, and are used to the present day, not only by the American Indians, but by peoples of mental culture and civilization. In almost every State in the Union burial caves have have been discovered.

The second class of burials are those by *embalment* or

mummification. The bodies are placed, after the process, in the earth, in caves, mounds, boxes on scaffolds, or in charnel houses. From the statements of the older writers on North American Indians, mummifying seems to have been practised among certain tribes in Virginia, the Carolinas and Florida, especially for persons of distinction. There is a class of mummies found in the saltpetre and other caves of Kentucky. It is an open question whether measures had been taken to preserve them, or whether the preservative influences of the soil or places of deposit would account for the condition in which the mummies were found.

The third class, *surface burial*, has been practised to only a limited extent, so far as has been discovered. The methods varied. Some placed their dead in hollow trees, in an upright position; occasionally in a hollow log lying on the ground. Other tribes, in logs split and hollowed out.

Blackbird, the famous chief of the Omahas, was buried seated on his favorite snow-white horse. He was in full dress and fully equipped, and on his head waved, to the last moment, his beautiful head-dress of the war-eagles plumes. The burial, as described by Catlin, was as follows: "Turfs were brought and placed around the feet and legs of the horse and gradually laid up to its sides, and at last over the back and head of the unsuspecting animal, and last over the head and even the eagle plumes of its valiant rider, where, all together, they have

smouldered and remained undisturbed to the present day."

Black Hawk, chief of the Sacs and Foxes of Illinois, was placed upon the ground in a sitting posture, his hands grasping his cane. The ground around it was picketed, as a protection against wild animals. The chiefs of that tribe were usually buried in this manner.

Other modes of surface burial were: placing the bodies on trees, on the ground a little scooped out and covered with planks, poles or birch bark, and sometimes beneath heaps of rocks.

Cremation is also noted as a mode of disposing of the dead. It was used to a considerable extent among the North American tribes, especially those inhabiting the western slope of the Rocky Mountains. The process was by a funeral pyre bearing some resemblance to the Greek and Roman funeral rite of burning.*

* Gen. Chas. H. Tompkins, U. S. A., furnishes the following account: "A very singular case of aboriginal burial was brought to my notice recently by Mr. Wm. Klingbeil, of Philadelphia. On the New Jersey bank of the Delaware river, a short distance below Gloucester City, the skeleton of a man was found buried in a standing position, in a high, red, sandy-clay bluff overlooking the stream. A few inches below the surface the neck bones were found, and below these the remainder of the skeleton, with the exception of the bones of the hands and feet. The skull being wanting, it could not be determined whether the remains were those of an Indian or of a white man; but, in either case, the sepulture was peculiarly aboriginal. A careful exhumation and critical examination by Mr. Klingbeil, disclosed the fact that around the lower extremities of the body had been placed a number of large stones, which revealed traces of fire, in conjunction with charred wood, and the bones of the feet had undoubtedly been consumed. This makes it appear reasonably certain that the subject had been executed—probably as a prisoner of war. A pit had been dug, in which he was placed erect and a fire kindled around him. Then he had been buried alive—or,

The last forms of burial described by Dr. Yarrow are what he terms *aerial sepulture* and *aquatic burial*. These are nearly allied to the former class, and embrace burial in lodges on a platform and beneath a tent, covered with buffalo hides or brush; in houses built in various designs, being wooden tombs; in a box or sarcophagus of wood, or a canoe, raised a little from the earth, or on scaffolds, and by placing the bodies on trees.

Aquatic burial is performed by depositing the corpse in a canoe and setting it afloat on streams or lakes remote from habitations. The Indians are very careful not to pollute the springs or streams near which they live by aquatic burial, unless it may be to poison the springs for white persons.

In "The Voyage of the Vega round Asia and Europe," made in 1878-'79 by Baron Nordenskiöld in command, is a notice of a burying place in the primeval forest of Siberia, near the houses of the inhabitants. The corpses were placed in large coffins above ground, at which, in most cases, a cross was erected. In one a sacred picture was inserted. Some clothes which had belonged to the departed were hanging on a bush beside the grave, together with a bundle containing food. The crosses

at least, if he did not survive the fiery ordeal, his body was imbedded in the earth, with the exception of his head, which was left protruding above the surface. As no trace of the cranium could be found, it seems probable that the head had either been burned or severed from the body and removed, or else left a prey to ravenous birds. The skeleton, which would have measured fully six feet in height, was undoubtedly that of a man."

indicated that they had some knowledge of the Christian religion, but heathen customs adhered to them. Among the Chukches of the Polar sea mounds were discovered by the same observers, containing burnt bones. The cremation had been so complete that only one of the pieces of bone could be determined—a human tooth. After cremation, the remains of the bones and the ashes had been collected in an excavation and covered first with turf and twigs and then with small, flat stones. It appears, by the observations of the navigators, that the Chukches sometimes burned their dead and sometimes exposed them to beasts of prey, with weapons, sledges, household articles and clothing. At Port Clarence, south of Cape Prince of Wales, North America, two Eskimo graves were noticed. The corpses had been laid on the ground fully clothed, without coffins, but surrounded by a close fence made of tent poles driven crosswise in the ground. Alongside of one of the corpses lay a kayak with oars, a loaded double-barreled gun, with locks at half cock and caps on, various other weapons, clothes, tinder box, snow shoes, drinking vessels, masks carved in wood and strangely-shaped animal heads, the latter such as were also seen in the tents of the living.

INTERMENT AMONG THE EARLY CHRISTIANS.

The new testament furnishes many passages to show that the Jews buried without their cities. The sepulchre in which the body of our Saviour was laid was in the

place where He was crucified. At our Lord's passion the graves were opened and many bodies of the saints which slept arose, and came out of their graves after His resurrection and appeared unto many in the holy city. The son of the widow of Nain was being carried without the city, when the procession was met by Jesus. The bodies of Ananias and Saphira were carried away for burial, and the body of the martyr, Stephen, who was stoned without the city, was buried where it lay.

The interment of the first Christians was undistinguished, and was like that of the common people. After they became a distinct class, they had their own peculiar funeral ceremonies, which partook of usages both Jewish and Gentile, but uniformly by burial. It was not long before the persecutors of the Christians under the Roman Empire and the carnage under Nero, greatly increased the number of martyrs. The tenderest emotions of nature and the impulses of their religion led them to provide a resting place for the slain, to protect their bodies from the rage of the people. They were taken charge of, and with secrecy and great caution transported under cover of the night to the public cemeteries. The catacombs soon became the repository of their remains,* but anticipating the evils which must

* The word catacomb is compounded from the Greek, and signifies, over against a hollow deeply excavated. The catacombs are not to be confounded with the cemeteries, each word having its own signification. Mission, a traveler in 1687-8, gives his opinion that no place in the world can compare with Rome

necessarily result from the accumulation of so many bodies in the place where they were accustomed to assemble for religious worship, they were abandoned.

Large tracts of land in the suburbs of Rome, given by the Patricians and some pious, wealthy women, were appropriated to purposes of burial. These were the origin of cemeteries (place of repose). More than forty such burial places are reckoned to have been opened in the suburbs of Rome. Ecclesiastical history has preserved their names. Here were erected altars and chapels, constructed for funeral ceremonies. The latter were also used for religious worship. The cemeteries were cared for with the greatest attention, and all became the sites of consecrated temples. This gave origin to the Basilics, which became the principal churches, on which the others depended and of which they formed a part.*

In the law of the twelve tables, enacted by the Decemviri (A. D. about 200), burial or burning of the dead within the city was forbidden. The statute was in force

for subterranean passages known as catacombs. They are not single vaults but whole cities of the dead, with turnings and windings, like streets dug out from the rock. Each passage is commonly from fifteen to eighteen feet wide, and twelve or fifteen feet high. The graves are hollow niches, one above another in rows, where the dead are deposited without coffins. These catacombs to the number of forty and more, running in all directions for unnumbered miles under the Roman Campagna, chiefly along the Appian Way, are witnesses of the faith and practice of early Christianity, as positive, as are the monuments of Egypt and Babylonia of Pagan beliefs and modes of life and worship. They assure us of their one design and purpose of *burial*, not cremation, which the Christians abhorred as Pagan.—*Monumental Christianity*.

* The Christians began to build churches in the second century. Their sites have been determined. The church of Antioch was erected in the third century. Destroyed by Diocletian.

for a long period. The admission of the remains of even holy personages was positively forbidden.

The Christian church in three centuries rested in comparative quiet, and finally perfect peace, by the conversion of Constantine, and by his memorable edict of toleration, in A. D. 313. The Pagan temples of idols ceased to be resorted to and were transferred to the worship of God. The altars at which the Christians worshipped in the catacombs and cemeteries in the suburbs, were transferred to the cities, and the relics of the martyrs took the places of the Pagan deities. Now it was, that a general desire was manifest for providing tombs within their cities. A wish to be buried near the temples of their worship is a natural one. They thought, too, that proximity to the places where the prayers of the holy were offered, would benefit the souls of the departed dead, and that the emanations from the bodies of the saints would warm the hearts of the faithful and encourage them in pious works.

Burials within or near a church had their origin in the request of the Emperor Constantine to be buried in the vestibule of the Basilica of the Holy Apostles, which he himself had built. His wish was granted as a mark of the highest honor. The successors of Constantine obtained a like distinction. Benefactors to the church received the same. The priesthood, by their sanctity and rank, were deemed worthy of the high privilege. The revolution thus begun was neither general nor rapid.

The bishops who granted the privileges adopted each his own regulations, which were stringent or otherwise, according to his views. In half a century interments within the city of Constantinople and other Roman cities became general,* for in A. D. 381, Theodosius renewed the edicts of his predecessors and prohibited interments in cities. He ordained that the bodies, urns, and sarcophagi within the walls of Rome should be removed to a distance. His design was to prevent infection of the air. Van Espen says: "*Imperatores Christiani sanctitatem civitatum violari credebant per corpora mortuorum quod nimio suo fœtore civitates infecerunt.*" "The Christian Emperors always censured the burial of the dead in cities; they feared contagion." Seneca says: "*Non defunctorum causa, sed vivorum inventa est sepultura, ut corpora et visu et odore fœda amoverenter.*"

The edict was observed for a considerable time, but it came to be disregarded long before Gregory the Great, by whom it was restored in Italy. "Whatever difference there might have been in the opinion between the Pagans and Christians as to the fate which awaits us after our mortal career, whatever variety the principles laid down in the Christian church, we always see the most enlightened princes maintaining, by their laws in relation to interments, those rules which were most in conformity with the real good of the community. The ancient eccle-

* The abuse of interring was carried so far that as to permit Pagans and Christians, the impious and holy, to be interred in the interior of their temples.

siastical constitutions, the letters of the Pontiffs, that sacred tradition which they are bound to preserve, all concurred in delivering cities from the infection of dead bodies; but this abuse, far from being destroyed, gained new strength. The innumerable causes for not looking upon the bodies of the dead with disgust, the flattering hopes they entertained of participating in the merits of the just, by partaking of their graves, the distinction which resulted in favor of those who had been deemed worthy of that honor, awakened among some sentiments of piety, excited among others the feelings of self-love. At length tyrannical custom overcame the law. The prerogative which was reserved for Emperors was at last the inheritance of the lowest class of citizens, and that which was at first a particular privilege became at length the common right of all."

Prior to and during the sixth century interments in cities were greatly increased. Synods and councils became earnest in their efforts to arrest the evil and to restore the ancient discipline of the church. The Council of Bracar contained a celebrated canon which forbade interment in churches, and proved also that cities have the right to prohibit any person from burying within its walls. Charlemagne, at the end of the eighth century, gave his earnest attention to ecclesiastical discipline. He held frequent councils in different parts of his kingdom, the decisions of which were formulated into his noted capitularies. One of his bishops, Theodolphus, complained

that the churches in France had become almost burial places. The capitularies of Charlemagne forbade interments of the laity within the churches, and subsequently that of all persons, without discrimination. He ordered the tombs to be destroyed, and wished for the future that they should never be raised above the level of the ground. Notwithstanding the measures enforced by Charlemagne, they were modified by subsequent councils, though the church desired that the prohibition should be obeyed. It fell into such a degree of neglect that the Emperor Leo, in the close of the ninth century, in codifying and publishing the canons of the church, erased in one of his statutes the old prohibition of burying in churches. The terms of his decree show that the old law had fallen into complete discredit, and had become a dead letter. He gives two reasons for its falling into disuse. The first was the distress of the people to see the bodies of their relatives carried so far from them ; and the second was the expense of transportation or great vexation of the poor.

Notwithstanding the decree of Leo, "it is equally certain that the church, always animated by the same principle, did not cease to enforce as much as possible the ancient usages. The councils, held from the tenth even to the eighteenth century, in various parts of the catholic world, bear evident testimony to that effect."*

* The following French bishops and archbishops have at the affixed dates promulgated in their sees ordinances against interments in towns or in churches :—Bishop of Avrauches, A. D. 1600 ; Bishop of St. Malo, 1620 ; Bishop of Lizieux, 1650 ; Bishop of La Rochelle, 1655 ; Bishop of Chalons, 1661 ;

From the beginning of history to the ninth century of the Christian era, it is manifest that however interments were modified by forms of religions or superstition, it was a universally accepted fact that exposure of the living to the corruption which succeeds the death of the body is injurious to the living, and becomes a source of disease and pestilence in crowded communities. It is a remarkable fact that intramural interments should have been allowed by the church and the State just when a knowledge of nature's laws began to be increased. The old nations of the world were, in their generations, wiser in their measures of protection than those of the new.

There is a popular belief that, as the wise Creator has ordained that we must die, and has taught us that the dead must be buried, He has so ordered that no evil results shall follow their burial. Such an argument proves too much. We know that pestilential influences arise from various other causes, and we provide against them. Death is a consequence of our fallen nature ; disease and pestilence are recognized evils. Whatever is believed to produce them must, if possible, be removed. That this is eminently true of the emanations from the putrefaction of decaying dead bodies, and especially so

Bishop of Amiens, 1662 ; Bishop of Orleans, 1664 ; Bishop of Aleth, 1670 ; Bishop of Cohors, 1673 ; Bishop of Senez, 1672-78 ; Bishop of Grenoble, 1690 ; Bishop of Noyon, 1691 ; Bishop of Soissons, 1700 ; Archbishop of Rouen, 1721, and in the same year the Bishop of Evreux and the Archbishop of Auch.

In about 1765 the Archbishop of Toulouse promulgated an ordinance concerning interments in churches, contained in fifteen articles. They were confirmed *in toto* by the Parliaments in France, and sanctioned by the King.

when in crowded cemeteries, cannot for one moment be reasonably questioned. The God of the Israelites permitted the laws of nature to operate as He had ordained them, but carefully protected his chosen people by statutes which guarded their health and banished from their dwellings and communities the causes of disease and pestilence.

The testimony of early scripture history admits the belief that uniformity of burial in sepulchres and in the earth among all nations after the deluge, had its origin in the mortuary customs of the old world. It is recorded of the three sons of Noah—(Gen. x) “by these were the nations divided in the earth after the flood.” We cannot doubt that the customs in which they had lived a hundred years before the deluge were carried with them and became the traditions of the new world.

ANIMAL PUTRESCENCE.

The facts which history so abundantly furnishes of the malignancy of animal putrescence are known comparatively to the few. They should be known and read of all men.

Doctor Haguenot, Professor of the University of Montpellier, France, was one of the earliest writers upon the dangers of interments in the city of his residence. Though long convinced of them, he delayed pointing them out till an event occurred under his own observation, which led him to raise his voice of warning and remon-

strance for the protection of the people against the reigning abuse. On the seventeenth of August, 1744, toward evening, the body of a layman was conveyed to a vault in the parish of Notre Dame of Montpelier, attended by a numerous procession of the clergy and laity. No less than three men perished on this occasion; a fourth was with difficulty recovered from a state of asphyxia, and a fifth was attacked with severe and alarming symptoms, which left him for a long while pale and feeble, and his recovery was very properly termed a resurrection. The catastrophe occurred as follows: While lowering the corpse, a man first went down to support the coffin, and fell senseless; another followed to assist him, and though drawn out in time was afflicted with the severe illness just noted; the third, who had the courage to offer his services, descended with a rope around his waist, and had he not been drawn up immediately, would have died; the fourth, a strong and vigorous man, trusting to his robust constitution, and only harkening to the call of humanity, dared the danger, and died upon entering the vault; the fifth came out once to recover strength, returned a second time, staggered from the ladder, and fell dead. The bodies were drawn up by hooks. Haguenot was authoritatively commissioned to investigate the conditions attendant upon this tragical event. He had the vault reopened and upon an examination he recorded the following experiments. The cadaverous fœtor exhaled was so intense as to adhere for a long time to any substance

which was exposed for a few moments in the vault. Lighted tapers, chips, papers and tarred ropes, when brought to the edge of the vault were instantly extinguished. Animals—dogs and cats—became instantly convulsed, and died in a few minutes; birds lived a few seconds. The vapor or gas was obtained and preserved in glass vessels. After six weeks it possessed the same qualities and produced the same effects.*

In the neighborhood of the church now noticed, Haguénôt says that the small pox broke out and raged with great violence, and remarks that the more gradual or weaker evolution of thin vapor fills the air with malign qualities, the germs of fatal or epidemic diseases, or they aggravate the symptoms of those prevailing.†

“Every one knows,” says Vicq. Dazyr, “that animal exhalations, particularly from a putrefying carcass, are very noxious and dangerous.” Diodorus Siculus (100 B. C.) notes pestilential diseases produced by the putrefaction of different substances. Saint Augustine makes mention of animals cast upon the seashore, whose putre-

* The investigations were in accordance with the infancy of chemical science, 140 years ago, and would now be considered defective and insufficient.

† The same writer gives a key to the explanation of miracles at the tombs of saints, as being natural causes in operation in sepulchral chambers. Gregory of Tours relates that a thief for the sake of plunder entered the tomb of St. Helius. The holy prelate miraculously detained him and he died. A poor man, who wished to cover the grave of his son with a stone, attempted to steal one from the tomb of a holy personage, and was instantly struck blind, deaf and dumb. Josephus in his antiquities says that the servants of King Herod who broke open the tomb of King David, were killed in the very act. These occurrences, he says, may be attributed to the poisonous vapors of the grave.

ying bodies created a widely extended pestilence. The waters of the Nile, as they return from the fields they have inundated, leave a multitude of aquatic insects, which, putrefying, exhale miasm. Egypt is thus exposed almost every year to malignant fevers. It is from that country that the small pox is scattered throughout the world. The putrefaction of grasshoppers in Ethiopia has caused epidemic diseases.

Lucian notes an epidemic which ravaged the army of Pompey, occasioned by the putrefaction of the horses killed and left on the field of battle. A great mortality occurred in the camp of Constantine the Great from similar causes. Carcases scattered over the field of battle have in all times caused mortal sickness. Aristotle advised Alexander to return immediately after the defeat of Darius, to avoid the malignant influence of the dead bodies. Long sieges, where many lives are lost, are commonly attended with fevers and fatal distempers. The war of the Swedes in the last century was the occasion of a pestilence which desolated Poland.

Some subterranean vaults at Paris, under the church of St. Eustace, were dug out, and some dead bodies were of necessity removed. They were put in a vault, for a long time shut up. Children who went there to catechism sickened. The same effect was produced in adults. Doctor Ferret, who made a report upon the subject, said that he found that the respiration of the sick was difficult; that the brain was disordered; they had violent

palpitation of the heart, and many were affected with convulsive motions in the arms and legs.

A lot of ground which had, in past times, a convent for the nuns of St. Genevieve, at Paris, was appropriated to the erection upon it of shops. All those who inhabited the ground floor, and particularly the young, were affected with similar complaints, which were, with good reason, attributed to exhalations from the dead bodies interred beneath.

An attentive physician, in making researches into the causes of the epidemic in Saulier, and carefully studying the sources and consequences of the facts, has shown that the contagion proceeded from a number of dead bodies buried in the parish of St. Saturnine. The cathedral of Montpellier was infected by the same causes.

Vicq. Dazyr says, in regard to these facts: "Were we to collect together all the observations of those who have gone before us, we should find proofs without number of what we advance; the small number of the learned and of persons capable of transmitting to posterity, accounts of the deadly effects of interments in churches and in towns—or rather the sanctity with which we ourselves have been used to consider the custom of interring in temples—has been often the reason of attributing to other causes the epidemic diseases which have, from time to time, depopulated our cities."

In Walker on Grave-yards (London, 1839), we read, p. 96: "A mild catarrhal fever prevailed in Saulieu, Bur-

gundy. The body of a very fat man was buried in the parish church of St. Saturnine. Twenty-three days afterwards a grave was opened by the side of the former, to bury a woman who had died of the same disease. A very fetid odor filled the church and affected all those who entered. In letting down the body the rope slipped, by which the coffin was shaken. A discharge of sanies followed, the odor of which greatly annoyed the assistants. Of one hundred and seventy persons who entered the church from the opening of the grave to the interment, one hundred and forty-nine were attacked with a malignant putrid fever, which had some resemblance to the reigning catarrhal fever; but the nature and intensity of the symptoms left no doubt that the malignity was owing to the infection of the cathedral."

Dodsley's *Annual Register*, July, 1773, gives the particulars of an accident which occurred in the same church: "Of one hundred and twenty young persons of both sexes who were assembled to receive their first communion, all but six fell dangerously ill, together with the Cure, the grave diggers and sixty-six other persons. The illness with which they were seized is described as a putrid, verminous fever, accompanied with hemorrhagic eruption and inflammation."

M. Maret, in a letter to the editor of the *Journal Encyclopedique*, in 1775, states that the curate of Arnay-le-duc, after having breathed the infected air arising from a dead body of one of his parishioners when he was per-

forming the funeral rites, contracted a putrid disease which had reduced him to the last extremity.

MALIGNANT DISEASE FROM ONE CORPSE.

The Rev. Dr. Render, in his "Tour through Germany," published in London, 1801, mentions the following case : " In the month of July, 17—, a very corpulent lady died at ——. Before her death she begged, as a particular favor, to be buried in the parochial church, and on the following Saturday was buried according to her desire. The day following the clergyman preached her funeral sermon. The weather was uncommonly hot and sultry, and a great drouth was prevailing. The succeeding Sunday the Protestant clergyman had a very full congregation of upwards of nine hundred persons, it being the day for administering the holy sacrament. The weather continuing very hot, many were obliged during the service to walk out for a time to avoid fainting, while some actually fainted away.

" It is the custom in Germany that when the people wish to receive the sacrament they neither eat nor drink that day till the ceremony is entirely over. The sermon occupied one hour and a quarter, after which the bread was consecrated and, according to custom, remained uncovered during the ceremony. There were about one hundred and eighty communicants. Before they had quitted the church, more than sixty of them were taken ill. Several died in the most severe agonies ; others, of

a more vigorous constitution, survived by the help of medical assistance. A most violent consternation prevailed throughout the whole congregation and town. It was concluded that the wine had been poisoned, and so it was generally believed. The sacristan and several others belonging to the vestry were immediately arrested and cast into prison. The clergyman, on the succeeding Sunday, preached very excitedly and pointed out several others concerned in the plot. This enthusiastic sermon was printed. The persons accused underwent very great hardships. During the space of a week they were confined in a dungeon, and some of them put to the torture, but they persisted in asserting their innocence.

“On the Sunday following, the magistrate ordered that a chalice of wine, uncovered, should be placed for the space of an hour upon the altar, which time had scarcely elapsed when they beheld the wine filled with myriads of insects; and, by tracing them to their source, it was at length perceived, by the rays of the sun, that they had issued from the grave of the lady who had been buried the preceding fortnight. The people not belonging to the vestry were dismissed, and four men employed to open the grave and the coffin. In doing this, two of them dropped down and expired upon the spot, and the other two were only saved by the utmost exertion of medical talent. It is beyond the power of words to describe the horrid sight of the corpse when the coffin was opened. The whole was a mass of entire putrefac-

tion, and it was clearly demonstrated that the numerous insects, both large and small, together with the effluvia which had issued from the body, had caused the pestilential infection which was for a while attributed to poison."

Bascom.

SATURATED SOIL OF A GRAVEYARD DISTURBED.

In the autumn of 1843, in Minchinhampton, a graveyard was disturbed which had existed five hundred years. In rebuilding the church it was deemed expedient to lower the surface of the graveyard to within a foot or two of those buried. The earth so removed, of a dark color—saturated, in fact, with the product of human putrefaction—was, in a fatal hour, devoted to the purposes of agriculture. About one thousand cart-loads were so employed, some on a new piece of burial ground to make the grass grow quickly, some as manure in the neighboring fields, some on the rector's garden, and some in that of the patron. The seeds of disease were thus widely sown, and the result was such as any person of common sense might have expected. The diffusion of a morbid poison which soon followed was evinced by an outbreak of fever in this once healthy locality. The family of the rector and the inhabitants of the streets adjoining the churchyard were the first attacked, and were also the greatest sufferers. The rector lost his wife, a daughter and his gardener. The patron's gardener, who had been employed in the unseemly art of dressing flower beds

with human manure, also died. The children who attended the school took the fever as they passed the upturned surface of the graveyard, went home and died, but did not communicate the disease to those who came near them. Seventeen deaths occurred, and upwards of two hundred children had measles, scarlet fever and various peculiar eruptions. *Bascom.*

This grave-yard had been in use 200 years when Bishop Latimer (1552) warned the people that intramural burials were dangerous to health. In a sermon on the raising of the widow's son, he says: "These citizens of Naim hadd their buryinge place withoute the citie, which no doubt is a laudable thinge, and I doe much marvel that London being soe rich a citie, hath not a buryinge place withoute, for no doubt it is an unwholesom thinge to bury within the citie, especiallye at such a time, when there be great sicknesses, and manie die together. * * * And I think no lesse but it is the occasion of great sicknesses and disease."

Adam Clarke in his commentary (1810-26) on the same scripture event, advises that "no burying place should be tolerated within cities or towns, much less in or about churches and chapels. This custom is excessively injurious to the inhabitants, and especially to those who frequent public worship in such churches and chapels. God, decency and health forbid this shocking abomination. * * * I am assured from long observation that churches and chapels situated in graveyards * * * are perfectly unwholesome, and many by attending such places are

shortening their passage to the house appointed for all the living. What increases the iniquity of this abominable and deadly work is, that burying grounds attached to many churches and chapels are made a source of private gain. * * * Every man should know that the gas disengaged from a human body is not only unfriendly to, but destructive of, animal life."

When Hannibal laid seige to the city of Agrigentum, in the south-western part of Sicily, for the purpose of raising a wall without, which should overlook and command the city walls, he collected all the materials within his reach, and among the rest destroyed and converted to his use the tombs standing around a city very ancient and populous, and then containing 200,000 inhabitants. From the uncovering and disturbing of so many dead bodies arose a terrible pestilence, which carried off immense numbers of the Carthagenians and the General himself. Afflicted at this dreadful mortality, the beseigers attributed it, with the superstition of the age, to the vengeance of the gods, incensed against them for violating the repose of the dead. The healthiness of the situation, the season, and the thorough appointment and supplies of the Carthagenian army, leave no room to doubt as to the real cause of the sickness, which gradually disappeared. Two remarks of some importance are suggested by the historian.

1. The folly of modern nations, especially in warm

climates, in suffering the interment of the dead within their cities.

2. The wisdom of some ancient nations in having a *dead* as well as a *living* town.

About 1843 a "report on the sanitary condition of the laboring population of Great Britain—supplementary report on the results of a special inquiry into the practice of interments in towns," was made by Edwin Chadwick, Esq., Barrister at Law, at the request of Her Majesty's principal Secretary of State for the Home Department. It was presented to both Houses of Parliament by command of Her Majesty.

The materials for the supplement on interments were collected from every source where useful information was likely to be obtained—from ministers of religion called upon to perform funeral rites in the poorer districts, from persons of the laboring class, from officers of benefit societies and burial clubs, from undertakers chiefly engaged in the interment of the dead of the laboring classes, from foreigners as to the various modes of interment in their own countries, and the administrative regulations thereon, and finally from eminent physiologists, as to the effects produced on the health of the living by emanations from human remains in a state of decomposition. The first part of the report is devoted to the examination of the evidence for and against the conclusions of medical witnesses of high professional position, by whom

it is alleged that the emanations from human remains in a decomposing state do not produce specific disease, and that they are not generally injurious. The learned writer aims to determine the question of the healthiness or otherwise of intra-mural interments, and traces the distinct effects produced by bodies in a state of decay and putrefaction. Respecting the innocuousness of putrefaction, the report notices the testimony of M. Parent Duchâtelet and Doctor Dunglison, which is not very conclusive in its nature, and which is easily set aside. The latter gentleman says that "we have no satisfactory proof that malaria ever arises from animal putrefaction singly," and then guards this negative proposition by the following admission.

"In stating the opinion that putrefaction singly does not occasion malarial disease, we do not mean to affirm that air highly charged with putrid miasmata may not, in some cases, powerfully impress the nervous system so as to induce syncope and high nervous disorder; or that when such miasmata are absorbed by the lungs in a highly concentrated state, they may not excite putrid disorders, or dispose the frame to unhealthy erysipelatous affections. On the contrary, experiment seems to have shown that they are deleterious when injected, and cases are detailed in which, when exhaled from a dead body, they have excited serious mischief in those exposed to their action."

In reference to Duchâtelet's statements, when he cites instances of the exhumation of bodies in an advanced state of decomposition, without any injurious conse-

quences being experienced by the persons engaged in conducting them, the accuracy of the evidence given is very quickly disposed of in a "Report of Doctor V. A. Riecke, of Stuttgart, on the influence of putrefactive emanations on the health of man," in which the medical evidence of this class is closely investigated. In reference to the statements of Duchâtelet on this question, Doctor Riecke observes:

"When Parent Duchâtelet appeals to and gives such prominence to the instance of the disinterments from the churchyard of Saint Innocens, and states that they took place without any injurious consequences, although at last all precautions in the mode of disinterring were thrown aside, and that it occurred during the hottest season of the year, and therefore that the putrid emanations might be believed to be in their most powerful and injurious state, I would reply to this by asking the simple question, what occasion was there for disinterment? Duchâtelet maintains complete silence on this point; but to me the following notices appear worthy of attention. In the year 1554, Houlier and Fernel, and in the year 1738 Lemery, Geoffroy and Hunaud raised many complaints of this churchyard; and the two first had asserted that during the plague the disease had lingered longer in the neighborhood of the Cinetière de la Trinité, and that there the greatest number had fallen a sacrifice. In the years 1737 and 1746, the inhabitants of the houses around the churchyard of Saint Innocens complained loudly of the revolting stench to which they were exposed. In the year 1755 the matter again came into notice. The inspector who was intrusted with the inquiry, himself saw the vapor rising from a large common grave, and convinced him-

self of the injurious effects of this vapor upon the inhabitants of the neighboring house." *

"Often," says the author, "the complexions of the young people who remain in the neighborhood grow pale. Meat sooner becomes putrid there than elsewhere, and many persons cannot get accustomed to these houses." In the year 1779, in a cemetery which yearly received from 2,000 to 3,000 corpses, they dug an immense common grave near to that part of the cemetery which touches upon the Rue de la Lingerie. The grave was fifty feet deep, and made to receive from 1,500 to 1,600 bodies. But, in February, 1780, the whole of the cellars in the street were no longer fit for use. Candles were extinguished by the air in them, and those who only approached the apertures were immediately seized with the most alarming attacks. The evil was only diminished on the bodies being covered with half a foot of lime and all further interments forbidden. But even that must have been found insufficient, as, after some years, the great work of disinterring the bodies from this churchyard was determined upon. This undertaking, according to Thouret's report, was carried on from December, 1785, to May, 1786; from December, 1786, to February, 1787, and in August and October of the same year; and it is not unimportant to note this, as it shows how incorrect is Duchâtelet in his general statement that those disinterments were carried on in the hottest seasons of the year. It is very clear that it was exactly the coldest seasons of the year which were chosen for the work; and though in the year 1787 there occurs the exception of the work hav-

* As an instance of the state of the cellars around the graveyard, it is stated that a workman, being engaged in one of them, put his hand on the wet wall. He was warned that the moisture on the walls was poisonous, and was requested to wash his hand in vinegar. He merely dried his hand on his apron. At the end of three days the whole arm became numb, then the hand and forearm swelled with great pain, blisters came out on the skin, and the epidermis came off.

ing been begun in August, it may be assumed that the weather was unusually cold, and it was therefore thought that the work might be carried on without injurious effects. It does not, however, appear to have been considered safe to continue the work at that season, as the operations were again discontinued, according to the report, in September.

Against those statements of Duchâtelet, as to the innocuousness of the frequent disinterments in Père la Chaise—statements which are supported by the testimony of Orfila and Ollivier in regard to their experience of disinterments—I would here state positive facts which are not to be rejected. ‘I,’ also remarks Duvergie, ‘have undertaken judicial disinterments, and must declare that during one of these, at which M. Piedagnel was present with me, we were attacked with an illness, although it was conducted under the shade of a tent, through which there was passing a strong current of wind; and, although we used chloride of lime in abundance, Piedagnel was confined to his room for six weeks.’ Apparently, Duvergie is not far wrong when he states his opinion that Orfila had allowed himself to be misled by his praiseworthy zeal for the more general recognition of the use of disinterments for judicial purposes, to understate the dangers attending them, as doubtless he had used all the precautions during the disinterments which such researches demand; and to these precautions (recommended by Orfila himself) may be attributed their few injurious effects. I cannot refrain from giving, also, the information which Fourcroy gained from the grave-diggers of the churchyard of St. Innocens. Generally they did not seem to rate the danger of displacing the corpses very high. They remarked, however, that some days after the disinterment the abdomen of the corpse would swell, through the great development of gas, and that if an opening forced itself at the navel or anywhere in the region of the belly, there issued forth the most horribly-smelling liquid and a mephitic gas. Of the last they had the greatest fear, as it produced

suddenly insensibility and fainting. Fourcroy wished much to make further researches into the nature of this gas, but he could not find any grave-digger who could be induced by an offered reward to assist him by finding a body which was in a fit state to produce this gas. They stated that at a certain distance this gas only produced a slight giddiness—a feeling of languor and debility. These attacks lasted several hours, and were followed by loss of appetite, weakness and trembling. “Is it not very probable,” says Fourcroy, “that a poison so terrible that when in a concentrated state it produced sudden death, should, even when diluted and diffused through the atmosphere, still possess a power sufficient to produce depression of the nervous energy and an entire disorder of the functions? Let anyone witness the terror of these grave-diggers and also see the cadaverous appearance of the greatest number, and all the other signs of the influence of a slow poison, and they will no longer doubt of the dangerous effects of the air from churchyards on the inmates of neighboring houses.”

Mr. Chadwick says that an eminent surgeon, who expressed to him his belief that no injury resulted from emanations from decomposing remains because *he* had suffered none, mentioned an instance where he had conducted the *post mortem* of the corpse of a person of celebrity which was in a dreadful state of decomposition, and that without injury, but admitted, as a casual incident, which did not strike him as militating against the conclusion, that his assistant was immediately after taken ill and had an exanthematous eruption.

He had been compelled to go to the seaside, and had not yet recovered. Another surgeon who had lived for

many years near a churchyard in the metropolis, and had never observed any effluvia from it, neither did he perceive any effects of such emanations, at church or anywhere else, yet admitted that his wife perceived the openings of vaults when she went to the church to which the graveyard belonged, and after respiring the air there, would say, "they have opened a vault," which upon inquiry would prove true. He admitted also that formerly in the school of anatomy which he attended, pupils were sometimes attacked with fever, which was called, "the dissecting-room fever" which, since better regulations have been made, is now unknown.

The fourth paragraph of Chadwick's report notices the evidence of another class to prove the innocuousness of the emanations of human remains upon the general health, to wit, the instances of persons acting as keepers of dissecting rooms and grave-diggers, and the undertakers' men who, it is stated, have pursued their occupations for long periods and have notwithstanding maintained robust health.

The examination of persons engaged in processes exposed to miasma from decomposing animal remains in general, only shows that habit, combined with associations of profit, often prevents or blunts the perceptions of the most offensive remains. Men with shrunk figures and the appearance of premature age, and a peculiar cadaverous aspect, have attended as witnesses to attest their own

perfectly sound conditions as evidence of the salubrity of their particular occupation. Generally, however, men with robust figures and the hue of health are singled out and presented as examples of the general innocuousness of the offensive miasma generated in the process in which they are engaged.

Professor Owen mentions an instance of a witness of this class, a very robust man—the keeper of a dissecting room—who appeared to be in florid health (which proved to be not as sound as he himself conceived), who professed perfect unconsciousness of having sustained any injury from the occupation, and there was no reason to doubt that he was really unconscious of having sustained or observed any ; but it transpired on inquiry that he had always had the most offensive and dangerous work done by an inferior assistant, and that, within his time, he had had no less than eight assistants, and that every one had died, and some of these had been dissected in the theatre where they had served.

The sextons of graveyards, who are robust men, frequently attest to their salubrity ; but, upon examining their inferiors, the grave-diggers, it appears when there is much to do, and even in the new cemeteries, that, as a class, they are unhealthy and cadaverous, and, notwithstanding precautions, often suffer severely on re opening graves, and that their lives are frequently cut short by their work. There are very florid and robust undertakers, but, as a class, and with all the precautions

they use, they are unhealthy. A master undertaker of considerable business in the metropolis says, that "in nine cases out of ten the undertaker who has much to do with the corpse is a person of cadaverous hue, and you may almost always tell him whenever you see him."

Fellmongers, tanners, or the workmen employed in the preparation of hides, have been instanced by several medical writers as a class who, being exposed to emanations from the skins when in a state of putrefaction, enjoy good health ; but it appears that all the workmen are not engaged in the process when the skins are in that state, and that those of them who are, as a class, do experience the common consequences. A French physician, M. Labarraque, states that, notwithstanding the constant exposure of tanners to the emanations from putrid fermentations, it has not been remarked of the workmen of this class that they are more subject to illness than others. A tanner, in a manual written for the use of the trade, without admitting the correctness of this statement, observes : " Whatever may be the opinion of M. Labarraque on this point, we do not hesitate to declare the fact that this species of labor cannot be borne by weakly, scrofulous or lymphatic subjects."

Mr. Barnett, surgeon, one of the medical officers of the Stepney Union, who has observed the symptoms in those who are exposed to the air of a crowded graveyard, thus describes them :

“ They are characterized by more or less disturbance of the whole system, with evident depression of the vital force, as evinced throughout the vascular and nervous systems by the feeble action of the heart and arteries, lowness of spirits, etc. These maladies, I doubt not, if surrounded by other causes, would terminate in fever of the worst description. Some years since, a vault was opened in the churchyard (Stepney), and shortly after, one of the coffins contained therein burst with so loud a report that hundreds flocked to the place to ascertain the cause. So intense was the poisonous nature of the effluvia arising therefrom, that a great number were attacked with sudden sickness and fainting, many of whom were, for a considerable time, in a state of ill-health.

“ The vaults and burial ground attached to Brunswick Chapel, Limehouse, are much crowded with dead ; and from the accounts of individuals residing in the adjoining houses, it would appear that the stench arising therefrom, particularly when a grave happens to be opened during the summer months, is most noxious. In one case it is described to have produced instant nausea and vomiting, and attacks of illness are frequently imputed to it. Some say they have never had a day's good health since they have resided so near the Chapel ground, which, it may be remarked, is about five feet above the surrounding yards and very muddy—so much so, that pumps are frequently used to expel the water from the vaults into the streets.”

The bursting of leaden coffins in the vaults of cemeteries, unless they are watched and “tapped” to allow the mephitic vapor to escape, are not infrequent. In cases of rapid decomposition, such instances occur in private houses before the entombment. An undertaker of considerable experience states :

"I have known coffins to explode like the report of a small gun in the house. I was once called up at midnight by the people, who were in great alarm, and who said that the coffin had burst, as they described it, with 'a report like the report of a cannon.' On proceeding to the house I found in that case, which was one of dropsy, very rapid decomposition had occurred, and the lead was forced up. Two other cases have come under my notice of coffins bursting in this manner. I have heard of similar cases from other undertakers. The bursting of lead coffins without noise is more frequent. Of course it is not told to the family unless they have heard of it, as they would attribute it to some defective construction of the coffins."

The occurrence of instant death to grave-diggers, from accidentally inhaling the concentrated miasm which escapes from coffins, is undeniable. Slower deaths from such exposure are designated as "low fevers," and whether or not the constitutional disturbances attendant be or be not true typhus, it suffices, as a case requiring a remedy, that the exposure to such an influence is apt to produce grievous and fatal injury amongst the public.

Doctor Riecke concludes, from the various cases which are given, that emanations from putrid remains operate in two ways; one set of effects are produced through the lungs by impurity of the air from the mixture of irrespirable gases, another through the olfactory nerves by powerful, penetrating, offensive smells. The evidence seems to establish the belief that offensive smells are true warnings of sanitary evils to the population. The fact of the general offensiveness of the emanations under consid-

eration is adduced by Doctor Riecke as evidence of their pernicious quality. He thus enforces his opinion :

“It certainly cannot be far from the truth to call the organ of smell the truest sentinel of the human frame. ‘Many animals,’ observes Rudolphi, ‘are entirely dependent on their sense of smell for finding out food that is not injurious. When their smell is injured they are easily deceived, and have often fallen a sacrifice to the consequent mistakes.’ Amongst all known smells there is, perhaps, no *one* which is so universally and to such a degree revolting to man, as the smell of animal decomposition. The roughest savages as well as the most civilized European, fly with equal disgust from the place where the air is infected by it. If an instinct can ever be traced in man, certainly it is in the present case. Is instinct a superfluous monitor exactly in this one instance? Can instinct mislead just in this one circumstance? Can it ever be that the air which fills us with the greatest disgust is the finest elixir of life, as Dumoulins had the boldness to maintain in one of his official reports?”

Section 10 of the report treats of the effects of the introduction of dead animal matter into living tissues, and its capacity to produce fatal disease. He quotes Doctor Southwood Smith, physician to the London Fever Hospital, who remarks that,

“The introduction of dead animal matter, under certain conditions, into the living body, is capable of producing disease, and even death, is universally known and admitted. This morbid matter may be the product of secretion during life, or of decomposition after death. Familiar instances of morbid animal matter, the result of secretion during life, are the poisons of smallpox and cowpox ; also the vitiated

fluids formed in certain acute diseases, such as acute inflammations, and particularly those of the membranes lining the chest and abdomen. On examining the body a short time after death from such inflammations, the fluids are so extremely acrid that even when the skin is entirely sound they make the hands of the examiner smart, and if there should happen to be the slightest scratch on the finger, or the minutest point not covered by cuticle, violent inflammation is often produced, ending sometimes in forty-eight hours in death. It is remarkable, and it is a proof that in these cases the poison absorbed is not putrid matter; that the most dangerous period for the examination of bodies who die of such diseases, is from four to five hours after death, and while the body is yet warm.

“That the direct introduction into the system of decomposing and putrescent animal matter is capable of producing fevers and inflammations, is proved by numerous experiments on animals, while the instances in which human beings are seized with severe and fatal affections from the application of the fluids of a dead animal body to a wounded, punctured or abraded surface are of daily occurrence.” *

“It is proved by indubitable evidence that this morbid matter is as capable of entering the system when minute particles of it are diffused in the atmosphere as when it is directly introduced into the blood-vessels by a wound. When diffused in the air, these noxious particles are conveyed into the system through the thin and delicate walls of the air vesicles of the lungs in the act of respiration. The mode in which the air vesicles are formed and disposed is such as to give to the

* The writer cites many examples of the very serious and often fatal results of the absorption of the poison of dead animal matter. The fact is now so fully recognized that it is not necessary to record them here. Those who at this day engage in examinations *post mortem*, are careful to protect the hands in some way from the dangers attendant. No prudent physician or surgeon is willing, after a *post mortem* which he has himself performed, to respond to a call upon a parturient woman.

human lungs an almost incredible extent of absorbing surface, while at every point of this surface there is a vascular tube ready to receive any substance imbibed by it, and to carry it at once into the current of the circulation. Hence the instantaneousness and the dreadful energy with which certain poisons act upon the system when brought into contact with the pulmonary surface. A single inspiration of the concentrated prussic acid, for example, is capable of killing with the rapidity of a stroke of lightning. So rapidly does this poison affect the system, that more than one physiologist has lost his life by incautiously inhaling it while using it for the purpose of experiment. The substances mixed with or suspended in the atmosphere may be conveyed with it to the lungs, and immediately enter the circulating mass. Any one may satisfy himself of this merely by passing through a chamber recently painted. The vapor of the turpentine diffused in the room is transmitted to the lungs with the air which is breathed and passing into the circulation, exhibits its effects in some of the fluid excretions of the body even more rapidly than if it had been taken into the stomach."

Facts such as these help us to understand the production and propagation of disease through the medium of an infected atmosphere, whether on a large scale, as in the case of an epidemic, which rapidly extends over a nation or a continent, or on a small scale, in the sick-chamber, the dissecting-room, the church, and the church-yard.

The exhalations arising from dead bodies in the dissecting-room are in general so much diluted by admixture with atmospheric air, through the ventilation which is carefully maintained, that they do not commonly affect the health in

a very striking or marked manner. By great attention to ventilation it is no doubt possible to pursue the study of anatomy with tolerable impunity. Yet few teachers of anatomy deny that without this precaution, this pursuit is apt to injure the health, and that with all the care which can be taken, it sometimes produces such a degree of diarrhœa, and at other times such a general derangement of the digestive organs, as imperatively to require an absence for a time from the dissecting-room, and a removal to the pure air of the country. The same statements are uniformly made by the professors of veterinary anatomy. The enquiries personally made into the state of health of persons licensed to slaughter horses, called knackers is, that though they maintain their health apparently for a time, yet the functions of the nutritive organs finally become deranged. They begin to emaciate and present a cadaverous appearance, slight wounds fester and become difficult to heal, and upon the whole they are a short-lived class.

The exhalations arising from dead bodies interred in the vaults of churches and graveyards are also so much diluted by the surrounding air that they do not commonly affect the health in so immediate and direct a manner as plainly to indicate the source of these noxious influences. It is only when some accidental circumstances have favored their accumulation or concentration that the effects become so sensible as obviously to declare their cause. Every now and then they do occur, of which there are

many instances on record. It may suffice for the present to mention only one, the particulars of which are obtained from a well-known gentleman, the accuracy of whose statements may be relied upon.

Mr. Hutchinson, surgeon, Farringdon street, was called on Monday morning, March 15th, 1841, to attend a girl aged fourteen, who was suffering from typhus fever of a highly malignant character. The girl was a daughter of a pew-opener in one of the large city churches, situated in the center of a small burying ground, which had been used for interments for centuries, the ground of which was raised much above its natural level, and was saturated with the remains of the bodies of the dead. There were vaults beneath the church in which it was still the custom, as it had long been, to bury the dead. The girl in question had recently returned from the country where she had been at school. On the preceding Friday, the fourth day before Mr. Hutchinson saw her, she had assisted her mother during three hours, and on Saturday during one hour, in shaking and cleansing the matting of the aisles and pews of the church. The mother stated that this work was generally done once in six weeks; that the dust and effluvia which arose always had a peculiar fetid and offensive odor, very unlike the dust which collects in private houses; that it invariably made her (the mother) ill for at least a day afterwards, and that it used to make the grandmother of the present patient so unwell that she was compelled to hire a person to perform the duty.

On the afternoon of the same day on which this young girl now ill had been engaged in her employment, she was seized with shivering, severe pain in the head, back and limbs, and other symptoms of commencing fever. On the following day all these symptoms were aggravated, and in two days afterwards malignant fever was fully developed. The skin was burning hot, the tongue dry, and covered with a dark brown fur, the thirst urgent, the pain of the head, back and extremities severe, attended with hurried and oppressed breathing, great restlessness and prostration, anxiety of countenance, low, muttering delirium, and a pulse of one hundred and thirty in the minute."

In this case it is probable that particles of noxious animal matter progressively accumulated in the matting during the intervals of its cleansing, set free by this operation and diffused in the atmosphere, always powerful enough to sensibly affect those accustomed to inhale them, were sufficiently concentrated to produce actual fever in one wholly unaccustomed to them, and rendered increasingly susceptible by her recent residence in the pure air of the country. It is a remarkable fact that miasms sometimes act with the greatest intensity on those who habitually breathe the purest air.

The miasms arising from churchyards are in general too much diluted by the surrounding air to strike the neighboring inhabitants with sudden and severe disease, yet they may materially injure the health, and the evi-

dence is decisive that they often do so. Among others who sometimes obviously suffer from this cause are the families of clergymen, when, as occasionally happens, the vicarage or rectory is situated very close to a full churchyard. One clergyman's family I know, whose dwelling-house is so close to an extremely full churchyard, was annoyed by a very disagreeable smell from the graves, always perceptible in some of the sitting and sleeping rooms. The mother of this family states that she has never had a day's health since she has resided there, and that her children are always ailing. Their ill health is attributed, both by the family and their medical friends, to the emanations of the churchyard.

The report of Mr. Chadwick gives also a communication, by Dr. Lyon Playfair, as follows:

“There are two kinds of changes which animal and vegetable matter undergo when exposed to certain influences. They are known by the terms of ‘decay’ and ‘putrefaction.’ *Decay*, properly so called, is a union of the elements of organic matter with the oxygen of the air; while *putrefaction*, although generally commencing with decay, is a change or transformation of the elements of the organic body itself, without any necessary union with the oxygen of the air. When decay proceeds in a body without putrefaction, offensive smells are not generated, but if the air in contact with the decaying matter be in any way deficient, the decay passes into putrefaction, and putrid smells arise. They are rarely, if ever, evolved from substances destitute of the element nitrogen.

“Both decaying and putrefying matters are capable of communicating their own state of putrefaction or of decay to any organic matter

with which they may come in contact. To take the simplest case : A piece of decayed wood, a decaying orange, or a piece of tainted flesh is capable of causing similar decay or putrefaction in another piece of wood, orange, or flesh. In a similar manner the decaying gases evolved from sewers occasion the putrescence of meat or of vegetables hung in the vicinity of the place from which they escape. But this communication of putrefaction is not confined to dead matter. When tainted meat or putrescent blood puddings are taken as food, their state of putrefaction is frequently communicated to the bodies of the persons who have used them, a disease analogous to rot ensues, and generally terminates fatally. Happily this disease is but little known among us, but it is of very frequent occurrence in Germany.

“ The decay or putrefaction communicated by putrid gases or by decaying matters does not always assume one form, but varies according to the organs to which their peculiar state is imparted. If communicated to the blood it might possibly happen that fever may arise ; if to the intestines, dysentery or diarrhœa might result. I think it might even be a question worthy of consideration whether consumption may not arise from such exposure. Certainly it seems to do so among cattle. The men who are employed in cleaning out drains are very liable to attacks of dysentery and of diarrhœa. I recollect instances of similar cases occurring among some fellow-students when I attended the dissecting-room.

“ The effects produced by decaying emanations will vary according to the state of putrefaction or decay in which these emanations are, as well as according to their intensity or concentration. Thus it occurs frequently that persons susceptible to contagion may be in the vicinity of a fever patient and not take the disease. I know one celebrated medical man who attends his own patients with fever without danger, but who has never been able to take charge of the fever wards of an infirmary, from the circumstance of his being unable to resist

the influence of contagion under such circumstances. This gentleman has had fever several times. This shows that the contagion of fever requires a certain degree of *concentration* before it is able to produce its immediate effects. A knowledge of this circumstance has induced several infirmaries to abolish altogether fever wards, and to scatter the fever patients indiscriminately through the medical wards, Owing to this distribution, cases in which fever is communicated to other patients or nurses in the infirmary are very infrequent, although they are far from being so in those hospitals where the fever cases are grouped together.

“I consider that the want of attention to the circumstance of the concentration of decaying emanations is a good reason that the effects of miasmata in producing fever is still a *quæstio vexata*. Thus there may be many churchyards and sewers evolving decaying matter, and yet no fever may occur in the locality. Some other more modified effect may be produced, according to the degree of concentration of the decaying matter, such as diarrhœa, or even dysentery; or there may be no perceptible effects produced, although the blood may still be thrown into a diseased state, which will render it susceptible to any specific contagion that approaches. It must be remembered that decaying exhalations will not always produce similar effects, but that these will vary, not only according to the concentration, but also according to the state of decomposition in which the decaying matters are.

“The rennet for making cheese is in a peculiar state of decay, or rather is capable of a series of states of decay, and the flavor of the cheese manufactured by means of it varies also, according to the state of the rennet. Just so with the diseases produced by the peculiar state or concentration of decaying matters or of specific contagions. When the Asiatic Cholera visited this country, many of the towns were afflicted with dysentery before the cholera appeared in an

unquestionable form. In like manner the miasmata evolved from churchyards may produce injurious effects which may not be sufficiently marked to call attention until they assume a more serious form by becoming more concentrated. But notwithstanding the absence of marked effects, it is extremely probable that constant exposure to miasmata may produce a diseased state of the blood. Thus I had occasion to visit and report upon, amongst other matters, the state of slaughter-houses in Bristol. These are generally situated in courts very insufficiently ventilated, as all courts are. I remarked that the men employed in the slaughter-houses had a remarkably cadaverous hue, and this was participated in a greater or less degree by the inhabitants of the court. So much was this the case that in a court where the smells from the slaughter-house were very offensive, my companion had immediately to return, from sickness. I immediately singled out one person as not belonging to the court from a number of people who ran out of their houses to inquire the object of my visit. The person who attracted my attention, from her healthy appearance compared with the others, had entered this court to pay a visit to a neighbor."

The conclusions which appear to be firmly established by the evidence and the preponderant medical testimony, are on every point, as to the essential character of the physical evils connected with the practice of interment, so closely co-incident with the conclusion deduced from observations on the continent, that they may be stated in the following terms :

"The injurious effect of exhalations from the decomposition in question upon the life and health of man, is proved by a sufficient number of trustworthy facts."

“That this injurious influence is by no means constant, and depends on varying and not yet sufficiently explained circumstances.”

“That the injurious influence is manifest in proportion to the degree of concentration of putrid emanations especially in confined places; and in such cases of concentration, the injurious influence is manifest in the production of asphyxia, and the sudden and entire extinction of life.”

“That in a state less concentrated, putrid emanations produce various effects on the nerves, of less importance, as fainting, nausea, headache, languor.”

“These emanations, however, if their effect is often repeated, or if the emanations be long applied, produce nervous and putrid fevers, or impart to fevers which have arisen from other causes, a typhoid or putrid character.”

“Apparently they furnish the principal cause of the most developed form of typhus, that is to say, the plague. Besides the products of decomposition, the contagious material may also be active in the emanations arising from the dead bodies.”

Such being the nature of the emanations from human remains in a state of decomposition, or in a state of corruption, it seems to be hopeless to obtain, in a crowded district, any definite or proximate evidence of the extent of the operation of those influences on the health of the people. In such districts the effects of an invisible fluid

have not been observed amidst a complication of other causes, each of a nature ascertained to produce an injurious effect upon the general health, but undistinguished except when it accidentally becomes predominant. The sense of smell in the majority of inhabitants seems to be destroyed, and having no perception even of stench which are insupportable to strangers, they are unable to note the excessive escapes of miasm as antecedents of disease. Occasionally some medical witness, who has been accustomed to the smell of the dissecting-room, detects that of human remains from graveyards, and some have said that they can detect what is called the "dead man's smell," when no one else can, and can distinguish it from that of the sewers.

The immediate consequence of the smell from a graveyard usually noted is headache. A military officer said that when his men occupied as a barrack a building which opened over a crowded burial ground in Liverpool, the smell from the ground was at times exceedingly offensive, and that he and his men suffered from dysentery. A gentleman who had resided near that ground said that he was convinced that his own health and that of his children suffered from it, and that he had removed to avoid further injury. The following testimony of a lady at Manchester is adduced as an example of the more specific perception of its effects. It brings to view also that in towns it is not only in surface emanations from graveyards alone, that morbid matter escapes :

You resided formerly in the house contiguous to the burying-ground of —— chapel, did you not? Yes, I did, but I was obliged to leave it. Why were you so obliged? When the wind was west, the smell was dreadful. There is a main sewer runs through the burying-ground, and the smell of the dead bodies came through this sewer up our drain, and until we got that trapped it was quite intolerable. Do you think the smell arose from the emanations of the sewer, and not from the burying-ground? I am sure they came from the burying-ground; the smell coming from the drain was exactly the same as that which reached us when the wind was west, and blew upon us from the burying-ground. The smell was very peculiar; it exactly resembled the smell which clothes have when they are removed from a dead body. My servants would not remain in the house on account of it. I had several cooks who removed on this account.

Did you observe any effects on your health when the smells were bad? Yes; I am liable to headaches, and these were always bad when the smells were so, also. They were often accompanied by diarrhœa, in this house. Before I went there and since I left, my headaches have been trifling.

Were any of the other inmates of the house affected with illness? I had often to send for the surgeon to my servants, who were liable to ulcerated sore throats.

And your children; were they also affected? My youngest child was very delicate, and we thought he could not have survived. Since he came here he has become quite strong and healthy, but I have no right to say the burying-ground had any connection with his health.

In the course of an examination of the chairman and surveyor of the Holborn and Finsbury Division of Sewers, on the general management of sewers in London, the following passage occurs :

You do not believe that the nuisance arises in all cases from the main sewers? (Mr. Roe.) Not always from the main sewers. (Mr. Mills.) Connected with this point I would mention that where the sewers came in contact with the churchyards, the exudation is most offensive.

Have you noticed that in more than one case? Yes.

In those cases have you had any opportunities of tracing in what manner the exudations from the grave-yards passed to the sewer? It must have been through the sides of the sewers.

Then, if that be the case, the sewer itself must have given way. No, I apprehend even if you use concrete, it is impossible but that the adjacent waters would find their way through the cement. It is the natural consequence. The wells of the houses adjacent to the sewers all get dry whenever the sewers are lowered.

You are perfectly satisfied that in the course of time exudations very often do, to a certain extent, pass through the brick-work? Yes; it is impossible to prevent it.

Have you ever happened to notice whether there was putrid matter in all cases where the sewer passed through a burial-ground? The last church-yard I passed by in the parish of St. Pancreas, when the sewer was constructing, I observed that the exudation from it into the sewer was peculiarly offensive, and was known to arise from the decomposition of the bodies.

At what distance was the sewer from the churchyard? Thirty feet.

Mr. Roe subsequently stated :

“ Mr. Jacob Post, living at the corner of Church street, Lower Road, Islington, stated to the clerk of our works, when we were building a sewer opposite Mr. Post’s house, that he had a pump, the water from the well attached to which had been very good, and used for domes-

tic purposes ; but that since a burying-ground was formed above his house, the water of his well had become of so disagreeable a flavor as to prevent its being used as heretofore. He was in hopes that the extra depth of our sewer would relieve him from the drainage of the burying-ground, to which he attributed the spoiling of his water."

Professor Brande states that he has "frequently found the well water of London contaminated by organic matters and ammoniacal salts," and refers to an instance of one well near a churchyard, "the water of which had not only acquired odor but color from the soil," and mentions other instances of which he has heard, as justifying the opinion that as "very many of these wells are adjacent to churchyards, the accumulating soil of which has been so heaped up by the succession of dead bodies and coffins, and the product of their decomposition, as to form a filtering apparatus, by which all *superficial* springs must of course be more or less affected." Some of the best springs in the metropolis are, fortunately, of a depth not likely to be considerably affected by such filtration. "In Leicester and other places I have been informed of the disuse of wells near churchyards on account of the perception of a taint in them." The difficulty of distinguishing by any analysis the qualities of the morbid matter, when held in solution or suspension in water, in combination with other matters, in towns, and the consequent importance of a separate examination already given to those qualities, may be appreciated by such cases as the following, which are by no means infrequent :

“ In the instance of the water in one well in the metropolis, which had ceased to be used in consequence of an offensive taste (contracted, as was supposed, from the drainage of an adjacent churchyard), it was doubted whether it could be determined by analysis what portion of the pollution arose from that source, what from the leakage of adjacent cesspools, and what from the leakage of coal gas from adjacent gas pipes. In most cases of such complications, the parties responsible for any one contributing source of injury are apt to challenge, as they may safely do, distinct proof of the separate effect produced by that one. If, therefore, the combined evil is to remain until complaints are made of separate causes, and their specific effects on the health, and until they can be supported by demonstration, perpetual immunity would be insured to the most noxious combinations.

The effects of unguarded interments have, however, been observed with greater care on the Continent, and the proximity of wells to burial-grounds has been reported to be injurious. Thus it is stated in a collection of reports concerning the cemeteries of the town of Versailles, that the water of the wells which lie *below* the churchyard of St. Louis, could not be used on account of its stench. In consequence of various investigations in France, a law was passed prohibiting the opening of wells within 100 metres of any place of burial; but this distance is now said to be insufficient for deep wells, which have been found, on examination, to be polluted at

a distance of from 150 to 200 metres. In some parts of Germany the opening of wells nearer that 300 feet has been prohibited.

Where the one deleterious cause is less complicated with others, as in open plains after the burial of the dead on fields of battle, the effects are perceived in the offensiveness of the surface emanations, and also the pollution of the water, followed by disease, which compels the survivors to change their encampment.

The fact is thus adduced in the evidence of Doctor Copeland :

“It is fully ascertained and well recognized that the alluvial soil, or whatever soil that receives the exuvæ of animal matter or the bodies of dead animals, will become rich in general. It will abound in animal matter, and the water that percolates through the soil thus enriched will thus become injurious to the health of those who use it. That has been proved on many occasions and especially in warm climates. Several remarkable facts illustrative of it occurred in the peninsular campaigns. It was found, for instance, at Ciudad Rodrigo, where, as Sir J. Macgregor states, in his account of the health of the army, there were 20,000 dead bodies put into the ground within the space of two or three months; that this circumstance appeared to affect the health of the troops, who were affected by malignant and low fevers and dysentery, or fevers frequently putting on a dysenteric character.”

In the metropolis, on spaces of ground which (in all) do not exceed 203 acres, closely surrounded by the abodes of the living, layer upon layer of the dead (each layer

consisting of a population numerically equivalent to a large army of 20,000 adults and nearly 30,000 youths and children), are every year imperfectly interred. Within the present generation, upwards of a million of dead must have been interred in these same spaces.

It has been considered that all danger from interments in towns would be obviated if no burials were allowed except at a depth of five feet. But bodies buried much deeper are found to decay, and so certain as a body has wasted or disappeared, is the fact that a deleterious gas has escaped. In the towns where the graveyards and streets are paved, the morbid matter must be diffused more widely through the subsoil, and escape with the drainage. If the interments are so deep as to impede escapes at the surface, there is only the greater danger of escape by deep drainage and the pollution of springs.

Doctor Reid detected the escape of deleterious miasma from graves of more than twenty feet deep. After noticing the accumulation of carbonic acid gas in the deep pits dug in some churchyards for receiving twenty or thirty bodies, and then suggesting a method for their ventilation, he further says :

“ Where the drainage of the district in which the church may be placed is of an inferior description, and liable to be impeded periodically by the state of the tide, as in the vicinity of the Houses of Parliament, where all the drains are closed at high water, the atmosphere is frequently of the most inferior quality. I am fully satisfied, for instance, not only from my own observations, but from different

statements which have reached me and also from the observations of parties who have repeatedly examined the subject at my request, that the state of the burying-ground around St. Margaret's Church is prejudicial to the air supplied at the Houses of Parliament, and also to the whole neighborhood. One of them stated to me lately that he had avoided the churchyard for the last six months, in consequence of the effects he experienced the last time he visited it. These offensive emanations have been noticed at all hours of the night and morning, and even during the day the smell of the churchyard has been considered to have reached the vaults in the House of Commons, and traced to sewers in its immediate vicinity. When the barometer is low, the surface of the ground slightly moist, the tide full and the temperature considerable (all which tend to favor the evolution of effluvia both from the grave pits and the drains) the most injurious influence upon the air is observed. In some places not far from this churchyard, fresh meat is frequently tainted in a single night, on the ground floor, in situations where, at a higher level, it may be kept without injury for a much longer period. In some cases in private houses, as well as at the Houses of Parliament, I have had to make use of ventilating shafts, or of preparations of chlorine, to neutralize the offensive and deleterious effects which the exhalations produced. No grievance, perhaps, entails greater physical evils upon any district than the conjoined influence of bad drainage and crowded churchyards; and, until the drainage of air from drains shall be secured by some proper measures, they cannot be regarded as free from a very important defect. The drainage of air from drains is desirable under any circumstances, but when the usual contaminations of the drain are increased by the emanations of a loaded churchyard, it becomes doubly imperative to introduce such measures. If anyone desires to trace the progress of reaction by which the graveyards are continually tending to free themselves of their contents, a very brief inquiry will

give him abundant evidence on this point. My attention was first directed to this matter in London ten years ago, when a glass of water handed to me at a hotel, in another district, presented a peculiar film on its surface, which led me to set it aside. After numerous inquiries I was fully satisfied that the appearance which had attracted my attention arose from the coffins in a churchyard immediately adjoining a well from which the water was taken. Defective as our information is as to the precise quality of the various products from drains, churchyards, and other similar places, I think I have seen enough to satisfy me that in all such situations the fluids of the living system imbibe materials which, though they do not always produce great severity of disease, speedily induce a morbid condition which, while it renders the body more prone to attacks of fever, is more especially indicated by the facility with which all the fluids pass to a state of putrefaction and the rapidity with which the slightest wound or cut is apt to pass into a sore."

Mr. Leigh, surgeon, and lecturer of chemistry at Manchester, confirms the researches of Mr. Reid, and observes :

"The decomposition of animal bodies is remarkably modified by external circumstances when the bodies are immersed in or surrounded by water, and particularly, if the water undergo frequent change, the solid tissues become converted into adipocire, a fatty, spermaceti-like substance, not very prone to decomposition, and this change is effected without much gaseous exhalation. Under such circumstances nothing injurious could arise, but under ordinary conditions slow decomposition would take place, with the usual products of the decomposition of animal matters. Here the nature of the soil becomes of much interest. If the burial ground be in a damp, dense, compact clay with much water, the water will collect round the body, and there will be a

disposition to the formation of adipocire, whilst the clay will effectually prevent the escape of gaseous matter. If, on the other hand, the bodies be laid in sand or gravel, decomposition will readily take place, the gases will easily penetrate the superjacent soil and escape into the atmosphere, and this with a facility which may be judged of when the fact is stated, that under a pressure of only three-quarters of an inch of water, coal gas will escape by any leakage in the conduit pipes through a stratum of sand or gravel in an exceedingly short space of time. The three seem to oppose scarcely any resistance to its passage to the surface. If the joints of the pipes are enveloped by a thin layer of clay, the escape is effectually prevented.

“If bodies were interred eight or ten feet deep in sandy or gravelly soils, I am convinced little would be gained by it. The gases would find a ready exit from almost any practicable depth.”

Mr. Leigh expresses the opinion that the “effects of these escapes in an otherwise salubrious locality soon attract notice, but their influence, in obedience to the laws of gaseous diffusion, is not the less scattered over a town because, in the multitude of scents, they escape observation. In open rural districts these gases soon intermix with the air and become so diluted that their injurious tendency is less potent.”

Mr. Chadwick closes that part of his report which relates to interments in the following words :

“From what has already been adduced, it may here be stated as a conclusion, that inasmuch as there appear to be no cases in which the emanations from human remains in an advanced stage of decomposition are not of a

deleterious nature, so there is no case in which the liability to danger should be incurred, either by interment, or by entombment in vaults (which is the most dangerous) amidst the dwellings of the living, it being established as a general conclusion, in respect to the physical circumstances of interment, from which no adequate grounds of exception have been established, that *all interments in towns, where bodies decompose*, contribute to the mass of atmospheric impurity which is injurious to the public health."

The allusion in Mr. Chadwick's report to *pits* for interment is explained by Mr. Duncan :*

"There are 39 burial-grounds within the borough of Liverpool. The interments take place in graves, vaults or pits. In 23 burial-grounds, graves only are used ; in 7, graves and vaults only ; in 4, graves and pits ; in 2, graves, vaults and pits, and in 1, pits only. The aggregate annual number of interments within the borough is, in ordinary years, from 10,000 to 11,000. Of this number, as nearly as can be estimated, about two-thirds take place in pits and one-third in graves. The interments in vaults probably do not exceed 20 annually.

"The pits vary in depth from eighteen to twenty feet, being from seven to twelve feet long and three and a half to nine feet wide. The number of bodies deposited in

* *Mass. Sanitary Rep.*

each pit varies from 30 to 120. In St. James' Cemetery, about six inches of earth are placed over the coffins after each day's interments. In the others the coffins are covered with two and a half feet of soil, which is removed previous to the next interments; but, with this exception, the pits remain open or only covered with a frame work of boards until filled with coffins—a period varying from ten days in the case of the smaller, to ten weeks in the case of the larger pits.

“ It has been estimated that an acre of ground is capable of affording decent interment to not more than 130 bodies yearly; but in the thirty-seven burial-grounds of Liverpool, taking one with another, the number of burials to an acre is fully double of that just stated. Were the calculations confined to those most in use, the proportion would be greatly augmented. In some of these places it is almost impossible to dig a new grave without disturbing bodies previously buried, and in some the soil when opened up appears to consist chiefly of human remains in a state of decomposition. It cannot be doubted that graveyards thus impregnated with decaying animal matter must contaminate the atmosphere in such a way as to injure the health, not so much by the production of sudden disease, which may be directly traced to its cause, as by a gradual process of deterioration leading to the development of disease in a more slow but equally certain manner. But the grand evil in the case of Liverpool, and that which calls most urgently for

interference, is the practice of burying large numbers of bodies in open pits. It must be unnecessary to say anything as to the injurious nature of this practice, if it be considered that in the hot weather of summer more than 100 bodies are collected together in an open pit, in all stages of decomposition, some of them having lain there for upwards of two months. Only two feet of space are left between the pits, so that the moisture, saturated with the decomposed matter of an adjoining pit, not unfrequently percolates through the intervening rock or soil into one that is newly made. In no case does the soil covering the pit, when filled, exceed the legal minimum of two and a half feet."

INTRA-MURAL BURIAL IN THE UNITED STATES.

The testimony of the consequences of intra-mural interments has thus far been drawn from England and the continent of Europe. It is reasonable that it should be first noticed. The vaults of their churches and their crowded churchyards voice the dangers of a system of burial begotten at the beginning of the middle ages, maintained throughout that dark period, and cherished down to the present century.

The first settlers of America came with the traditions of the land of their fathers. They buried their dead in their midst, and their descendants do so still. A population comparatively sparse and the ventilation of broad

acres surrounding our towns and cities have blinded the people to the evils which they are fostering for their descendants, as an inheritance of disease and death. There is, however, evidence in our own country sufficient to warn of our dangers, and of the urgent necessity of making provision against them.

YELLOW FEVER.

In the early years of the present century, the attention of the citizens of the City of New York was directed to the frequency of sickly periods when malignant disease, more particularly yellow fever, was apprehended year after year.* The streets then were narrow, irregular and confined. The water was obtained from wells. The slips on the river borders were receptacles of immense quantities of filth, the sewers emptying into them between high and low water.

The yellow fever, when it invaded the city, was not confined to the slips, nor did it always commence there, though always in localities where there seemed to be a recognized cause. In 1822 no nuisances of the ordinary kind existed in the part of the city which was infected. The only cause on which suspicion could rest was the

* The writer of this well remembers, when he was a youth living on Long Island, a few miles from New York, the exodus of the people from the city into the towns of Long Island, fleeing from the yellow fever. It did not occur every year, but so often that it was every year expected.

cemetery of Trinity Church, which contained so many thousands of dead. This cemetery is thus described by Dr. Ackerly, (1822): "Trinity churchyard is on high ground, west of Broadway, and contains about two and a half acres. It is walled up on two sides above the adjoining streets. Its westerly wall is ten or twelve feet high, of more than 300 feet on one side of Lumber street, which is very narrow. This church was first built in 1698, and its graveyard has been receiving the dead from that time to the present—a period of 124 years. More persons are probably interred within its precincts than in any burying-ground in the city, and it is supposed to contain the remains of human beings almost equal in number to the present population of New York. A burial can scarcely take place without disturbing a previous one, and the bodies cannot be deposited at a sufficient depth. I have seen a corpse* in Trinity churchyard not more than eighteen inches under ground, and a less depth in another instance in another burying-ground in this city."

Dr. Ackerly claims, with justice, that such collections must become a cause of sickening exhalations, and a residence near them cannot be safe and healthful. He further says: "It may be asked, what proof have we of its sickening influence, and why has it not before caused similar mischief? To this it may be answered, in general, that the cup must be full before an addition will make it

* There are many now living who can testify to the offensive odor from the yard when passing it in the evening on Broadway.

overflow. But this same ground emitted pestilential vapors during the revolutionary war, the recollection of which is not obliterated from the memory of a number of living witnesses. In the hard winter of 1780-81, this city was in possession of the enemy, and the ground was so frozen that the soldiers and others who were buried there during that long and severe winter were interred but a small distance beneath the surface. The consequence was that in the ensuing warm season it became so offensive as to require the interposition of the military commandant, and the Hessian soldiers were employed in covering the whole ground with a fresh stratum of earth three or four feet thick."

In 1814 a battalion of militia was stationed on a lot in Broadway, the rear of which was bounded on Potter's Field (now Washington Square), from which arose a most deadly effluvium. A number of the soldiers were attacked with diarrhœa and fever. They were removed at once. One of the sick died. The others rapidly recovered.

An article in the *Commercial Advertiser*, Sept. 7, 1822, furnishes further facts. It will be remembered that the graveyard being above the streets on the west, and encompassed by a massive stone wall, and the east side being level with Broadway, it results that this body of earth, the surface of which has no declivity to carry off the rains, thus becomes a great reservoir of contaminating fluids, suspended above the adjacent streets. In proof of this it is stated that in a house in Thames street

springs of water pouring in from that ground occasioned the removal of the tenants on account of their exceeding fœtidness. The cellars of all the houses in the streets west of the churchyard were all more or less accessible to impure springs of water. These springs had their source in the graveyard, which was twenty-five or more feet higher than the last street below (west) it. The report of the Board of Health up to Saturday, October 26, gave the number of cases of yellow fever as 401. The aggregate mortality was 256, and the comparative mortality of this Broadway district with the other district where the disease occurred was nearly three to one. "This," the writer says, "is unexampled in the history of yellow fever in the United States.

The Board of Health in its report notices that of 65 persons, residents of the upper part of the city,* who visited the sickly district, 34 died, showing a diminished proportion of mortality. Doctor Pascalis remarks upon this: "Since, therefore, it exhibited a greater degree of malignity in one part of the city than in another, and precisely in that district which is termed the cleanest and healthiest, we must necessarily conclude that it was aggravated by local circumstances. Again, in these narrow, central, and more confined streets—William, Maiden Lane, Stone, and Dutch, no more than one-third of the sick fell victims. In three houses and three families in

* The city did not extend above Canal street.

Dutch, Maiden Lane and Nassau, thirteen persons have sickened; seven were reported and all have recovered. The milder nature of these cannot certainly be accounted for but by their distance from their primary focus of infection."

There were other graveyards and vaults in proximity to that of Trinity. The South Reformed Church having a space of 25,000 square feet in Garden street, which was narrow and confined; and Wall Street Church, covering with the building 20,000 square feet, nearly the whole of which was excavated for vaults, and an additional range constructed under the sidewalk. Between Pine and Cedar streets were the burying grounds of the Associate Reformed and French Protestant Churches.

The Middle Dutch Church Cemetery was a considerable place of interment and appropriated to vaults; as also St. Paul's Church and the North Dutch Church, in Fulton street. St. Paul's was contiguous to Broadway. The monuments now standing in it bear testimony to its being the resting place of large numbers of the dead. Nearly opposite to it was the cemetery of Brick Church, which, in 1823 was entirely filled. Pascalis, in commenting upon these, and other burial places which he makes "of less account," says "there is, as all know, at the slightest computation, ten acres or 500,000 square feet of ground in the city exclusively appropriated to interments in graves or vaults. * * * We will take the subject in another point of view, to ascertain whether the space thus em-

ployed may endanger the health of the inhabitants. On the authority of observation and experience, it * * * takes more than ten years for the entire decay of the human frame in graves, and a much longer time than that in vaults. * * * The yearly bills of mortality at the city inspector's office for the last eleven years amount to 33,945. We have here then, a total of 33,945 dead bodies dispersed and accumulated within an area of three miles, during eleven years and a half, all still under the decomposing operation of nature, and diffusing, in the warm season, their volatile exhalations in the air we must respire." Doctor Barrow says of them: "They (the graveyards) are saturated with materials hostile to human life." In a work published prior to 1823 is the following warning: "Avoid as much as possible living near churchyards. The putrid emanations arising from churchyards are very dangerous; and parish churches, in which many corpses are interred, become impregnated with air so corrupted, especially in spring when the ground begins to grow warm, that it is prudent to avoid this evil, as it may be, and in some cases has been, one of the chief sources of putrid fevers, which are so prevalent at that season."

The following personal experience of a resident of New York was given to Doctor Ackerly, in a letter from Newburg, July 7, 1823: "During the summers of 1816, 1817, I resided at 39 Liberty street, directly opposite the churchyard. In the hot months, whenever a vault was opened on the side of the yard next to my residence, a

very offensive stench was emitted from the vault, to such a degree that we were compelled to shut the door and windows looking into the yard. Being frequently annoyed by this nuisance, I remonstrated with the sexton against his opening the vaults in the morning and permitting them to remain open during the day, to the annoyance of the neighborhood. His reply was that it would be as much as his life was worth to go into the vault until it had stood open some time to air. I applied to the Mayor to correct the proceedings. He said it was a subject of so much feeling with the citizens that the corporation would not interfere to regulate interments.

“In the summer of one of the years I have mentioned, the trustees of the church made some repairs to it, and built a porch to each of the eastern doors next to Liberty street. In digging for the foundation of the southeast porch, next to the sugar-house, they came upon the great grave in which had been buried those who died in this sugar-house while it was occupied as a prison during a period of the revolution. The grave was deep and spacious, and it became necessary, in order to get at the solid earth for the foundation of the porch, to disinter a great quantity of the remains of those who had been buried there. Several cartloads were taken up and carried away. During this operation the air of the churchyard and its vicinity swarmed with myriads of little black flies, very troublesome. They filled our house, covering the side-board, furniture, and every article on which they could



alight. Even closing the doors did not entirely relieve us from their annoyance.”*

Co-incident with the above, the *Medical Repository* gives the experience of a person who, on the 19th of August, 1810, when the thermometer noted 88°, attended the funeral of one whose remains were laid in the public vault of this same church. He stated that he was never so sensible of a cadaverous fœtor. The effluvia from the dead corpses was so offensive that he and many others were obliged to retreat from its mouth. In depositing a corpse in one of the vaults in the Brick Church, Beckman street, the sexton cautioned the attendants to “stand on one side; you are not accustomed to such smells.” Mr. DeGroat, the sexton of the Dutch Church above noted, frequently remarked that, in descending into the vaults, candles lose their lustre, and that the air is so sour and pungent that it stung his nose. The *Journal* says: “This being the case with all the vaults where dead bodies are deposited, and subject to be opened at all seasons, this method of disposing of the remains of our friends is, at the best, an unpleasant and certainly a dangerous one.”

The writer records an incident of his own observation,

* This phenomenon occurred at least thirty-five years after the interments. (*Vid.* Doctor Render's narrative in a former part of this treatise.) History informs us that after the mob at Paris, in the time of the French Revolution, broke into the vaults of the Kings, and broke open the coffins for plunder, they were overcome and sickened by the poisonous emanations from the coffin of Francis I, who died in 1557. He had been then buried two and a half centuries.

occurring in a family to which he is remotely allied. A family in New York who had purchased a lot in Greenwood and there buried many of their dead, was desirous of transferring the body of an honored ancestor from a vault where it reposed in a town in Connecticut to their own burial plot in Greenwood. Two members of the family circle, one a clergyman, the other a lawyer, undertook to conduct the details of the transfer. They were both healthy men, in the usual vigor of early manhood. They both entered the vault. They found it to be very foul. One of them fainted ; the other suffered much, but persevered in superintending the process of removal. The one who fainted—the clergyman—became sickly from that moment, and died in about two years, suffering during those years with a broken down constitution. The other lost from the same date the vigor of his health. He lived for several years and then died. Their memory is cherished by those who survive them all the more, in that they had sacrificed their lives in a work prompted chiefly by a desire to gratify their family kindred.

The Board of Health in the City of New York, in 1806, appointed a committee to report on measures necessary to secure the public health. The following extract from the report, which was drawn by Doctor Edward Miller, is appropriate in this place :

“That interments of dead bodies within the city *ought to be prohibited*. A vast mass of decaying animal matter produced by the superstition of interring dead bodies

near the churches, and which has been accumulating for a long lapse of time, is now deposited in many of the most populous parts of the city. It is impossible that such a quantity of animal remains, even if placed at the greatest depth of interment commonly practised, should continue to be inoffensive and safe. It is difficult, if not impracticable, to determine to what distance around, the matter extricated during the progress of putrefaction may spread; and by pervading the ground, tainting the waters and perhaps emitting noxious exhalations into the atmosphere, do great mischief. But if it should be decided still to persist in the practice of interments within the city, it ought to be judged necessary to order the envelopment of the bodies in some species of calcareous earth, either quicklime or chalk. * * * This growing evil must be corrected at some period, for it is increasing and extending by daily aggregation to a mass already very large, and the sooner it is arrested the less violence will be done to the feelings and habits of our fellow-citizens."

This report, upon being sent to the Legislature with a memorial upon the subject, resulted in the passage of a law authorizing the corporation of the City of New York to prohibit interments within its limits. The law was afterwards incorporated into the general statutes of the State. It was not till 1823 that the Common Council of New York passed a prohibitory ordinance upon the subject, and when passed it was some years before it became operative.

During a series of experiments made at and near Burlington, Iowa, in 1851-2, by Rauch,* for the purpose of determining the relation which ozone held to certain epidemic diseases, he says that "he could not usually detect its presence where any considerable amount of animal or vegetable matter was undergoing rapid decomposition. It was not until the weather became very cold that he could detect its presence within the cemetery enclosure or in the immediate vicinity of slaughter or packing-houses." "In the same proportion as the presence of ozone was found everywhere, certain types of disease diminished." His observations have satisfied him that ozone exists more abundantly in the atmosphere—other conditions being the same—after than before a thunder storm, and that, according to the degree of its electrical disturbance. During the prevalence of the cholera at Burlington, in 1850, the weather was very hot and oppressive. On the 16th of July a thunder storm occurred, accompanied by a heavy fall of rain. The epidemic immediately abated. One case only occurred on that day; the number of new cases diminished. The observations of the writer, for which he can furnish abundant data, lead him to say: "There is no room for doubt that ozone is a purifier of the atmosphere, and that anything, no matter what, which diminishes the

* "Intra-mural Interments in Populous Cities and their Influence upon Health and Epidemics, by John H. Rauch, M. D. Chicago, 1866."

normal amount of ozone acts injuriously upon man and animals."

"Reasoning, therefore, from a purely chemical, physiological and philosophical standpoint, we are fully warranted in making the assertion that the emanations of human remains frequently result in disease, increase the ravages of epidemics, in many instances act as the exciting causes of them and diminish life." As illustrating his statement, he notices among others which have heretofore been noticed in this treatise, that the opening of a corpse at Leictourne occasioned a grievous epidemic on the plain of Armagnac. At Riorm, in Auvergne, they were removing the earth from an old burying-ground for purposes of embellishment; soon after, an epidemic disease carried off many, particularly of the lower classes, who lived in the vicinity of the cemetery. At Aubert Haller, a church became infected from a single corpse after twelve years' interment, in consequence of which all the members of a convent were attacked with a dangerous malady.

We draw from Rauch's excellent monograph the following valuable testimony: In a report of the yellow fever of 1838-39, which occurred at Charleston, it was attributed to domestic origin, viz.: the decomposition of animal and vegetable matter. The report recommended the burial of the dead beyond the precincts of the city.

In a report of epidemic yellow fever as it occurred in British Guiana in 1852-53, Dr. Blair says: "The poison-

ous agent persisted in its predilection for damp, low, crowded places and the neighborhood of putrid exhalations, and woe to the unwary or reckless who lived or lingered in such places or were exposed to such exhalations."

Report of the Sanitary Commission on the Epidemic Yellow Fever of 1853, in New Orleans, by Dr. E. H. Barton.

In looking over the sanitary map accompanying this report, it appears that the Fourth District suffered more than double that of any other, the mortality being at the rate of 452 per 1,000 of the population. In this district three extensive cemeteries exist, in which were buried the year before nearly three thousand bodies. It was in one of these that the offensive exposure of bodies occurred, so painful to the public. In the First ward of this district was a series of low, crowded and filthy pest-houses, inhabited by the lowest class of people. The proportion of deaths here was 542 per 1,000.

The next in mortality was the Third, containing all the cemeteries and most of the vacheries. The proportion here was 508 per 1,000.

The First District comes next; the ratio to the whole population was 234 per 1,000. The second worse ward in this district is the Seventh, in which are the Girod street cemetery, two extensive hospitals and the gas-works. The number of fatal cases in it was 394 per 1,000.

In the Second District we have 87 cases per 1,000.

Ward No. 2, having more than double the amount of the average of the district, or 173 per 1,000, embraces in its limits all the cemeteries of the district, in which were buried that year 1,163 bodies.

The Third District shows 114 fatal cases to the 1,000. In noting the causes of the mortality in this district, much of it is attributed to the polluting air of a cemetery in which were buried during the year 2,446 bodies.

Doctor Barton says: "There is probably no climate in America where the vicinage of cemeteries would and does do so much damage to public health as here. Rapid and prolonged decay results from the great moisture of the climate and small desiccative power. Burying almost universally above ground (in the cemeteries of the city), the mortar connecting the brick-work soon splits, giving exit to injurious exhalations from the within decompositions. The force of the gases (and especially under the augmented temperature of the summer, when they are the most injurious), is often so very great as sometimes to burst the leaden coffins, and always to escape through the pores of the wooden ones, and to split the metallic ones, and the brick and plaster work of the vaults, contaminating the atmosphere for a great distance around. In no case then, if permitted in cities, should a dwelling be permitted nearer to these yards than several hundred paces, according to the frequency of interment."

The entire commission unite in the recommendation that "the present cemeteries within the city limits should by all means be closed against future use."

Doctor Bryant, on yellow fever at Norfolk and Portsmouth in 1855 (*Am. Jour. Med. Sci. Ap.* 1856), after giving a history of the epidemic and its terribly fatal results, and offering some suggestions upon a future correct hygiene, says :

“ The last and at the same time one of the most important of these suggestions relates to the remains of the dead. They can scarcely be said to rest beneath the sod. They lie in tiers, and some of them, from the sad necessity of the case, uncoffined, while but a thin stratum of sabulous earth separates them from the water below and the superincumbent air. The average depth of the graves is about four feet, the deepest five, and in many of them three bodies are placed, one upon the other. When the summer’s sun shall pour its rays down upon this decaying mass, can it be otherwise than that their noxious gases will commingle with the purer air, and sooner or later aid in reproducing other harvests of disease and death.

* * * I am aware that it is affirmed by some that animal decomposing matter is not deleterious. This is far from being established by sufficient facts. The remedy here indicated is the disinterment of the dead, and their removal to a distance of not less than eight miles from either city. It is the total forbidding of intra-mural or even near-by suburban cemeteries.”

ASIATIC CHOLERA.

Next to yellow fever the *cholera* is the epidemic most dreaded in this country. It is in truth more to be dreaded, as the fever is more or less limited to sections, while all parts of the United States are liable to an invasion of Asiatic cholera.

A very significant lesson upon the spread of this disease may be drawn from the study of its origin and progress in India and Asia.

It is well known that outbreaks of the disease occur especially in the province of Bengal every year, more particularly every third, sixth, ninth and twelfth year, in connection with the great pilgrimages to Juggernaut, Hurdwar, and their affiliated shrines. The influence of the Juggernaut pilgrimages, or of the Worshipers of Shiva, the Destroyer, can be traced from 1781 through the great twelve year epidemics of 1817, 1829, 1841, 1853, and 1865 in India, stretching north to Calcutta and south to Madras, on the east coast of Hindostan, while the influence of the pressure of the adorers of Vishnu to Hurdwar in the north of India, and to numberless other sanctuaries, may be seen in the great outbreaks of 1819, 1831, 1843, 1855, and 1869 in India and adjoining places.*

* "Report of Jno. C. Peters, M. D., in Cholera Epidemic of 1873 in the United States, by Jno. M. Woodworth, M. D.," 1875.

Every year, particularly at the great festivals, the pilgrims flock in crowds to the Juggernaut temple. It is calculated that there are at least 1,200,000 of them annually, of whom, it is said, nine out of ten die on the road of famine, hardship and sickness. It is a well-known fact that the country for miles around the sacred place is covered with human bones. Many old persons undertake the pilgrimage that they may die on holy ground. Not far from the temple is a place called by the Europeans *Golgotha*, where the corpses are thrown, and dogs and vultures are always feeding on the carrion.*

Epidemiologists have concluded that the presence, persistence and recurring activity of cholera in Persia is owing to its central location between India and Europe, exposing it to frequent importation and invasion, which scarcely allows one outbreak to subside before another is introduced. But a similar effect of pilgrimages seems manifest in Persia as in India. From Bassorah, near the united mouths of the Tigris and Euphrates, the disease is frequently carried by pilgrims to the holy shrines of Kerbala (Meshid Hossein) and Nedjef (Meschid Ali), just south of Bagdad. From W. A. Shephard's book, "From Bombay to Bushire and Bassorah," we learn that Bassorah, at the head of the Persian Gulf, has many pilgrim boats, which are always crowded with the living and the dead going up to Kerbala and Nedjef. The living car-

* Ency. Am.

goes, consisting of men, women and children, are huddled together like pigs, from one hundred to one hundred and fifty being crowded together in a space forty feet by twenty, with twenty-five or more dead bodies piled about. As these pilgrim-boats passed or went to windward the scent was anything but pleasant, and it was difficult to say whether the living or the dead were most disagreeably fragrant. Then the Arabs living along the shores of the rivers not only stop the vessels and rob the living, but also take and hold the dead bodies in pawn till the price they set upon them is paid by the sorrowing relatives, who believe that their own souls and those of their dead relatives will never reach paradise unless they get their bodies to the tombs of Hossein or Ali, at Kerbala or Nedjef. At the two latter places, and at Meschid Reza, the gorgeous mosques are hardly less sacred to the various sects of Mohammedans than is the mosque at Mecca. "They are," says the *London Lancet*, "probably the most important fostering places of cholera in North and South Persia; for they are burial places of Hossein, Ali and the Imam Reza, the three most highly-rated saints next to Mohammed. To their shrines not less than one hundred and twenty thousand pilgrims flock annually from Persia and India, bringing with them many hundred corpses in all stages of decomposition, for interment in the sacred soil of these great holy cities."

The pilgrim caravans are described as a sea of long, black boxes surging by on scores of mules and camels.

Each animal is laden with two of these mysterious objects, one on each side. Many of them are so loosely nailed together that another sense than that of sight soon convinces the beholder that they are coffins. In fact, they contain the putrefying bodies of the devout, who, having died in the true Mohammedan faith, are now being taken for burial in holy ground at Meschid, Kerbela or Nedjef. They are often carried hundreds of miles, and a sickening stench always comes up from their gaping seams, causing nausea and faintness in the drowsy and unsuspecting traveller, who finds it impossible to extricate himself promptly from their disgusting contact with apparently no limit to their numbers.

The *Lancet*, in another number, says that for several years previous to 1870, outbreaks of cholera at Teheran had almost invariably followed the arrival of the pilgrims and the annual exhumation of bodies for transportation to their holy places. The epidemic was very virulent in Teheran in 1870. It commenced at the caravanserais near the principal gates of the city, as if coming from pilgrims and travelers, and rapidly extended into the town in various directions. This outbreak was again attributed to the exhumation of bodies preceding the annual pilgrimages to Kerbala and Merschid, for not less than three hundred were dug up at Teheran.

Trinity churchyard, New York, has been the centre of a very fatal prevalence of cholera whenever the disease

has occurred as an endemic near or within a quarter of a mile of it. Trinity place, west of it ; Rector street, on its border ; the streets west of Rector, and the occupants of the neighboring offices and commercial houses, have suffered severely at each visitation of the pest, from 1832 to 1854. *Letter of Elisha Harris, M. D.*

During the prevalence of the cholera at Burlington, Iowa, in July, 1850, a number of the dead were interred in the city cemetery. No deaths occurred in its neighborhood until about twenty had been buried there. After this, until the epidemic ceased, cases occurred, and always in the direction from the cemetery in which the wind blew. *Dr. Rauch.*

The excavations made for sewers where the victims of the plague of 1665 were buried, increased the virulence of the cholera in London in 1854. The authorities had been warned of this probable result by Mr. Simon. Dr. Playfair believes that the prevalent fever in Rome is due to the exhalations from the soil, which is saturated with organic matter. "It is impossible for anyone to say how long the *materies morbi* may continue to live under ground. If organic matter can be boiled and frozen without losing vitality, and seeds 3,000 years old will sprout when planted, it would be hardihood to assert that the poison of cholera or small-pox (or typhus), whatever it is, may not for years lie dormant, but not dead, in the moisture and temperature of the grave." *Buck's Hygiene.*

PESTILENCE.

Pestilence is a terrible, perhaps the most terrible, scourge of the human race. The Hebrews in Egypt said to Pharaoh "let us go * * * and sacrifice unto the Lord our God, lest He fall upon us with the pestilence." The Psalmist of Israel said of the dealings of Jehovah with His chosen people, He "gave their life over to the pestilence and smote all the first-born of Egypt,"

Natural causes are at times operative, and always have been, to promote epidemic disease. The condition was called by Hippocrates a constitution of the air. We have no better term for it now. The great national pestilences, plague and cholera, have had their rise in the east and have progressed westward. They seem to be periodical or cycloid in their character, which is also true of the type of our ordinary diseases, undergoing, as they do, changes in long cycles of years.

The origin and causes of pestilence are occult. We have no reason to believe that they will not, to some degree, always be concealed. The pestilence "walketh in darkness." He who "hath gathered the wind in His fist," holds the supreme control of the hidden forces of nature. Nevertheless, He has endowed His creatures with powers to perceive and with intellect to study their modes of operation, that they may use their knowledge for their own protection, and thus put away from them

the larger share of the natural evils which are sources of suffering and affliction.*

A candid and careful consideration of the facts which have now been presented, cannot fail, we think, to convince any one of the necessity of accepting them as a warning against shutting our eyes to their light, and against cherishing longer in our crowded communities the *enormous evil* of INTRA-MURAL INTERMENTS. It is not the great pestilences only which are promoted and intensified by them. The testimony before us shows that our ordinary endemics, scarlet fever, diphtheria, and the minor diseases of children, become epidemic and widely fatal,

* There is nothing in the *mere climate* of Egypt that will account for the spontaneous origin and spread of the plague. Its development may be reasonably attributed to hygienic conditions. Its inhabitants create the causes of their own destruction. The destitution, filth and misery of the poor are extreme. Their wretched hovels are so horribly disgusting as to defy description. They are the receptacles of heaps of ordure and putrid matters. Not unfrequently the dead are buried under the mud floors of the dwellings of the living. Many of the graves in the cemeteries (which are always within the villages) being left open, are continually exhaling a stench which is intolerable to any stranger. The hygienic state of the cities and larger towns is not much better than that of the villages. Cairo, with its 200,000 inhabitants, is a very hot-bed of the most disgusting and pestiferous impurities. The canal which traverses it constantly steams forth a cloud of intolerable offensiveness. There are thirty-five cemeteries, of which twenty-five are within the walls. In the Copt quarter of the town the dead are buried under the floors of the houses, and nothing but a few boards separate the living from the putrid bodies of the dead. From eighty to ninety corpses have been known to be huddled together in these *sub-domal* receptacles. The plague has never been known to appear spontaneously in Egypt except in places and seasons where these most pernicious agencies are at work.

All the producing causes of this terrible disease being found united in Lower Egypt, it is there endemic. It is seen every year in the sporadic, and about every tenth year in the epidemic form.

The hygienic reforms necessary in modern Egypt are sanitary methods to counteract the evils of animal putrefaction. *Rep. of the Royal Acad. of Med., Paris, 1846, in Med. Chi. Rev., Oct., 1846.*

by the same influences. It is "sufficient to prove conclusively the truth of the chemical, physiological, and pathological deductions arrived at in the consideration of the subject; and that the same laws hold good in all important epidemic visitations, no matter in what quarter of the globe, and under what circumstances they have appeared." *Rauch.*

RURAL CEMETERIES.

Cemeteries extra-mural, in our own country, have been commending themselves to the popular favor for the last fifty years. Considerations for the public safety and health, doubtless, have had their effect, but their moral influences more. The retirement they afford to surviving friends in their visits to the graves of loved ones; the quiet precincts of the sacred place, made beautiful by the embellishments of artistic tillage and the inspiration of natural scenery, combine to make attractive and sacred the city of the dead. They become places of respectful and reverent resort. In our own, as in other countries, they have the effect of soothing the grief of surviving friends, and in refining the sentiments of the communities where they are established. At Constantinople the place of promenade for Europeans is the cemetery at Pera, which is planted with cypress, and has a delightful site on the side of a hill overlooking the Golden Horn. The greatest public cemetery attached to that capital is at Scutari, which forms a beautiful grove, and vies in its

attractions to readers, with the fountains and cloisters of the mosques.

In Russia, almost every town of importance has its burial place, at a distance from the town, laid out by the architect of the government. It is always well planted with trees, and is frequently ornamented with good sculpture. Nearly every German town has its cemetery at a suitable distance, planted with trees and ornamented with public and private monuments, though most of them have some choice works of art or public memorials which alone would make them objects of attraction. At Saxe Weimar, the cemetery contains the tombs of Goethe and Schiller, placed in the mausoleum of the ducal family. In Turkey, Russia and Germany, the poorer classes have the advantage of interment in the national cemeteries. In Russia it is the practice to hold festivals twice yearly over the graves of their friends. In some parts of Germany similar customs prevail. At Munich the festival of All Saints' Day is described as one of the most extraordinary spectacles which is to be seen in Europe. The tombs are decorated in a most remarkable manner with flowers natural and artificial, branches of trees, canopies, pictures, sculptures, and every conceivable thing that can be applied to ornament or decoration. During the whole of the night preceding the holy day, the relations of the dead are occupied in completing the decoration of the tombs, and during the whole of All Saints' Day and the day following, the cemetery is visited by the entire population

of Munich, including the King and Queen, who go there on foot, and by many strangers from distant parts. Mr. Loudén states that when he was there it was estimated that 50,000 persons had walked round the cemetery in one day, and all, with very few exceptions, dressed in black.

We have made this record to illustrate the salutary and refining influence of a rural burying-place, in contrast with the confined, offensive and health-polluting graveyard of a populous city.

The cemetery at Boston—Mt. Auburn—was established in 1831; Laurel Hill, soon after; Greenwood, N. Y., in 1842. Now, the most of our larger towns have their rural repositories for the dead, though too many of them still permit burials within their populated limits.

Such being the popular sentiment in regard to burials without the city, it has become a question of the highest importance how to locate them and what methods to adopt in their management and in all their mortuary requisites, that their moral influences may be promoted and the best sanitary results secured.

In the Tenth Annual Report of the Local Government Board, London, 1881, upon the "Sanitary Requirements of Cemeteries," it is pointed out that a cemetery, according to the Public Health Act, is not to be constructed nearer any dwelling-house than 200 yards, except with the consent of the owner or occupiers. The prescribed minimum distance of a cemetery in France from the

nearest habitation is 100 metres (109 yards), and it is not lawful, without special permission, to build any house or dig any well within that distance of an existing cemetery. The report alluded to says: "It may be taken that a distance of 200 yards is amply sufficient to prevent any injury arising to health from a well-kept cemetery, so far as regards noxious matters transmitted through the air. It is, however, by no means certain that cemeteries established under the Public Health Act will in all cases, and at all times, be distant so much as 200 yards from the nearest human habitation. With the consent of the owners and occupiers of existing houses, a cemetery may be established within the prescribed limit; and it is competent to anyone afterwards to erect a new house as near to the cemetery as he pleases. It does not appear that the amount of danger to health to be feared from a proximity to a well-kept cemetery is large. Since intramural interment has been abolished, recorded cases of injury to health, or even of nuisance arising from graveyard emanations, whether conveyed by air or water, are extremely rare."

The most suitable distance for a cemetery will vary in different cases. It will be greater in the case of a large than of a small town; greater, also, in the case of a town larger and rapidly extending than in one small and stationary.

The site should be elevated sufficiently above the region surrounding, so as to receive the benefit of free

ventilation by the winds, which should have an unobstructed approach to it from all points of the compass. It should not be on a high hill, as the springs of water at its base are liable to contamination from its drainage.*

Its surface should be undulating, but not to such a degree as to cause the moisture to collect in the low places, unless they can be thoroughly drained. The undulations of the surface afford opportunity to make the place more attractive by the arts of the landscape gardener.

Trees should be cherished, trimmed from below and not standing too densely. Evergreens should not abound if they feather from the ground. Hedges of arbor vitæ and dense shrubs around and within the burial plots ought to be forbidden. They collect and hold the noxious gases which rise from beneath. No vegetation, however beautiful in itself, should prevent the free circulation of the air which dilutes the emanations from the

* "In searching for cases of *recent* date of disease resulting from graveyard infection, we find that such are almost unknown to medical literature. The only marked European case which we have yet discovered is that mentioned by Pietra Santa, of the villages of Rotendella and Ballita, in Italy. The cemeteries of these villages were at the summit of a wooded hill, at a considerable distance from the houses. The springs from which the water was obtained were at the foot of the hill, and ultimately the water became highly contaminated. A severe epidemic which recently visited these villages was ascribed to the use of this impure water. A similar case occurred during the past year in Barbary, as an incident of the plague which has recently visited that country. The people of a certain village lived in excavations in rocks, getting their water supply from wells into which water had run from the cemetery where bodies were covered only a foot deep with gravel. Those only who had drank of this impure water were attacked with the plague." *I. F. A. Adams, M. D., in Report of Mass. B. of Health, 1875.*

graves and thus renders them innocuous. Trees should never be allowed to impede the circulation of the air and the free access of the winds to the grounds.

The soil best adapted to secure the rapid progress of decomposition is a sandy soil or a sandy loam, with a mixture of vegetable mould. Clay retards putrefaction and holds the corpse buried in it through a long series of years. A dense clay is laborious to work and difficult to drain. It retains, in a concentrated state, the products of decomposition, sometimes to be discharged into graves opened in their vicinity, or sometimes to escape through cracks in the ground to the surface. A district with a stony sub-stratum should be avoided. The loose, stony soil allows the passage of effluvia. The overlying soil should be at least eight feet deep. If hard rock lies beneath, sufficient drainage is afforded to the fluids of the graves. Fissured rock beneath a superstratum of sand or gravel, receives the surface water with great rapidity, and conducts it oftentimes to considerable distances. If beneath a cemetery, the wash of the superincumbent soil thus contributes to the pollution of neighboring wells and of the remoter sources of water supply.*

* The rapidity with which a deposit of sand drinks up water is illustrated by Geo. P. Marsh in his "Earth as Modified by Human Action." He says on page 477: "In a heavy thunder storm, accompanied by a deluging rain, which I witnessed at Mount Sinai in the month of May, a large stream of water poured in an almost continuous cascade down the steep ravine north of the convent by which travelers sometimes descend from the plateau between the two peaks, but, after reaching the foot of the mountain, it flowed but a few yards before it was lost in the sands."

In the selection of a cemetery site, the pollution of wells and of water supply should receive especial attention.

In the Report of the British Local Government Board, before noticed, upon the "Relations of a Cemetery to Sources of Water Supply," we read: "It is evident that the drainage of a cemetery should not be allowed to enter a stream from which water is drawn for domestic purposes. The degree to which the purity of neighboring wells is endangered by a cemetery, and the distance to which contamination may extend, obviously depend in each particular case upon the relative elevation of the respective sites of cemetery and well, and upon the nature and dip of the intervening strata, so that it would seem impossible to lay down a general rule for all cases. Fissured rock might allow foul matters to traverse considerable distances, while the interposition of a bed of clay or a water-tight vault would shut them off, or the passage through an aërated stratum of finely-divided earth would oxidise and destroy them on their way. A dangerous state of things is, when the graves and wells are sunk near together in a shallow, superficial, water-bearing stratum of a loosely porous nature, resting on impervious clay. It does not appear, however, that the risk to which wells are exposed from the proximity of a properly-managed cemetery is, in ordinary cases, great."

Dr. Rauch, in his "Intra-mural Interments," &c., states, in regard to interments in the City of Chicago about

1860, that, owing to the properties of the soil of its cemeteries, it is impossible that the gases emitted from the dead should be absorbed to any extent or neutralized by its action. The drainage into the lake from every portion of these cemeteries was manifest ; and from the topography of the ground and the sandy nature of the soil, resting on a stratum of clay, the rainfall percolates the sand and decomposing mass of animal matter until it comes to the clay, and is carried thence to the lake, less than half a mile above the Water Works. The current which is flowing constantly along the shore sweeps whatever noxious elements may come from the cemeteries to the very source of the universal water supply of Chicago.* The subsequent facts are these : The population, in six years, increased 70,000, and in the immediate vicinity of the cemeteries 100 per cent. In like manner the mortality increased, manifested in an increase of burials almost equal to the increase of population.

The Mass. State Board of Health (report of 1875) notices the following examples of water pollution which had been recently reported.

At a meeting at Milan, Dr. Polli, to prove that inhumation taints air and water, referred to certain researches of Prof. Selmi, of Mantua, and to the chemical analyses of the waters of Milan, by Professors Parvesi and Rontondi.

M. Ducamp discovered in Paris a well, the water of

* This was the case in 1860. The mode of supply of water was subsequently changed.

which was entirely derived from cemeteries. It had acquired a sulphur-like taste, so that the people bought it for mineral water.

The following case is also furnished: "In the last remarkable report of the Faculty of Medicine of Saxe, Reinhard relates that nine large and several smaller victims of the cattle plague were interred at Dresden at a depth of ten or twelve feet. It was found the next year that the water from a well situate one hundred feet from the pit in which they were buried had a fetid odor, and contained butyrate of lime. At a distance of twenty feet it had the disgusting taste of butyric acid and each quart contained about thirty grains of this substance." The bodies were subsequently disinterred and buried.

The water from graveyards contains ammonium and calcium nitrates, and nitrates, and sometimes fatty acids and much organic matter. Lefort found a well of water at St. Didier, more than 300 feet from a cemetery, to be highly contaminated with ammoniacal salts and an organic matter left on evaporation. The water was clear at first, but had a vapid taste, and speedily became putrid. *Parke's Hygiene.*

A recent report on the preservation of the *Anthrax germ* in graves furnishes the following fact :

In Livingston County, New York, on a sandy soil over a heavy clay soil, the graves were carefully fenced in by direction ; but nearly a year after, during a rainy period, the liquid oozing out on the river bank between the clay

and sand, and opposite one of the fenced graves, was licked by six cattle, all of which promptly perished of anthrax. The grave was now fenced in down to the water, and no further deaths occurred. *Report of Dr. James Law on the Bacillus Anthracis, in "Contagious Diseases of Domesticated Animals."* U. S. Department of Agriculture, 1881.

The germs of cholera and of typhoid fever are mainly thrown off by the bowels. If they are exposed to the free action of the air on the surface of the soil, they soon become innocuous. If they are thrown into a close privy vault, or into an unventilated sewer, their virulence is increased, and their emanations are intensely pestilential. Atkins says that the specific germs of typhoid fever may be propagated among healthy persons, first, by percolation through the soil into wells that supply drinking water; second, by issuing through defects in sewers; third, by exhalations through apertures of ill-trapped water-closets. *Ibid.*

Professor Fleck, of Dresden, having made extended and minute investigations of water from wells situated in or near cemeteries, published the same in 1873. Dresden has ten cemeteries, two within the city, the others suburban. Water from wells situated in nine was carefully analyzed between June and November, 1872, and the results given. The remarks of Fleck upon these analyses are in part as follows:

“In general, there is little agreement in composition among the well waters from the different cemeteries in Dresden, and it seems evident that the greatest influence is exerted, not by the proximity and age of the graves, so much as by the character of the ground. With the exception of the water from the Trinity and Elias Cemeteries (in which cases the wells are situated in clean, coarse gravel), the amount of organic matter is very considerable. This is the case to a marked degree in the well waters of the oldest cemeteries—the Anna Cemetery, the Catholic Cemetery, and the old Evangelical Cemetery,—where, besides notable quantities of nitrates, there was found a very considerable amount of unoxdized organic matter. In the Heller Cemetery, which is in clean sand on the right bank of the Elbe, the amount of nitric acid is very small; but the amount of ammonia and of organic matter is quite large. These differences can be explained only by taking into account, in addition to the influence exerted by the character of the soil, also the effect of the ground water itself. A ground water at a great depth, moving slowly, that is to say, flowing with a slight fall, will dilute the matter dissolved from the soil less, and will afford a concentrated solution containing a larger proportion of organic matter than a ground water flowing rapidly; and since in the Trinity Cemetery the ground slopes somewhat rapidly towards the Elbe, we may infer that the motion of the ground water is also somewhat rapid. This condition of things gives us as a product a water which is poor in decomposed and undecomposed organic matter, that is to say, a nearly pure water in spite of the greater amount of lime salts originally contained in the ground water. In no other one of the cemeteries are the conditions so favorable as in the Trinity; and in the case of the Anna Cemetery (Annenkerchhof), where we should expect a rapidly-moving ground water, on account of the declivity of the surface, there is lacking, in the neighborhood of the wells, the porous material necessary to bring about a rapid decomposition of the contents of the graves.

"It may be stated, as the result of experience, that the best locality for a cemetery is on a porous, coarse-grained, gravelly soil, with rapidly moving ground water, that is to say, situated on a declivity. In such a situation the processes of decay go on more rapidly, and consequently it is possible to renew the graves in a comparatively short time."

The author of the report from which Professor Fleck's remarks are taken issued circulars to nearly 500 physicians, with a view of ascertaining the experience of the medical profession as to the influence of cemeteries, as at present managed, upon the public health. The circulars were sent to medical observers in this country and in Great Britain. The questions he propounded were :

I. Have you observed any instances in which sickness appeared to be induced or aggravated by the proximity of dwellings to cemeteries. If so, please cite cases.

II. In such cases have you attributed such sickness to poisoned wells, or foul air, or both?

Of the one hundred and seventy-one correspondents who responded, eleven have observed sickness from this cause; three attributing it to foul air, four to poisoned wells, and four to both causes combined. The remaining one hundred and sixty-one have never observed any such phenomena. A considerable number state that the cemeteries in their vicinity are at a distance from habitations.

The process and progression of putrefaction in organic bodies are governed by the particular circumstances which surround them. The remains of the young decompose

with greater rapidity than those more advanced in life; those of females more speedily than of males; those dying in full health than those whose tissues are wasted by disease.

Persons dying from diseases of a malignant nature, or where the fluids are in a depraved condition, decompose with still greater rapidity. When decomposition takes place, the parts become soft; they change in color, exhale a disgusting odor, diminish in weight, and afford several new products, some of which escape in gaseous form; others pass off in a liquid state, and others again are contained in a fatty or earthy residuum. The principal elements of animal matter are carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorus. These, during life, with a few other elements, are variously combined to form the different tissues of the body. During life they are held together in a solid or liquid form. When life ceases they separate from one another, form new combinations and escape. *Rauch.*

A certain temperature and a certain degree of moisture are indispensable agents in the common process of putrefaction. Could these be avoided, human bodies might last indefinitely. When a certain degree of cold exists it tends to check the destructive process. When it extends to congelation its protecting power is complete.*

* The most remarkable instance of preservation by frost of an animal body, is that of an elephant of an extinct species, discovered in 1806 in the ice of the polar seas by Mr. Michael Adams. The animal was first seen by a chief of the Ton-

Maret thinks that the extent of cemeteries should be determined by the time necessary for the total destruction of bodies inhumed within them. He means by total destruction, the dissolution of the soft tissues, leaving the bones dry and entire. He thinks three years sufficient to decompose a body in a grave four or five feet deep. At a depth of six feet, the process of putrefaction is retarded by pressure. From this he reasons that the ground should be so apportioned as to contain three times the mortality of a year, if the graves are four or five feet deep. If they are six or seven feet deep, it should contain four times that amount. Such a calculation relates to grounds for burial which are to be used without that reverent regard for the permanent repose of the dead which in our own country is a chief consider-

guse tribe, in the year 1799. At this time it was imbedded in a rock of ice about one hundred and eighty feet high, and had only two feet, with a small part of the body projecting from the side so as to be visible. At the close of the next summer the entire flank of the animal was thawed out. It required five summers to thaw the ice so that the whole body could be liberated. At length, in 1804, the enormous mass separated from the mountain of ice and fell over upon its side on a sand bank. At this time it appears to have been in a state of perfect preservation, with its skin and flesh as entire as when it had existed before the deluge, or during that condition of the globe which placed animals apparently of the torrid zone in the confines of the Arctic circle. The Tonguse chief cut off the tusks, which were nine feet long and weighed two hundred pounds each. Two years after this event, Mr. Adams being at Yakutsk and hearing of the animal journeyed to the spot. He found the animal in the same place but greatly mutilated by the dogs and wolves of the neighborhood, which had fed upon the flesh as fast as it thawed. He succeeded, however, in removing the whole skeleton and in recovering two of the feet, one of the ears, one of the eyes and about three-quarters of the skin, which was covered with reddish hair and black bristles. These are now in the museum at St. Petersburg. *Bigelow's "Modern Enquiries."*

ation in founding cemeteries where their sacred dust shall be preserved from future disturbance.

The length of time necessary to effect complete decomposition varies according to the soil. It is shorter in one porous and open than in one either dense or clayey. The regulations of the Home Office (British) prescribe that no unwallled grave shall be reopened within fourteen years after the burial of a person above twelve years of age, or within eight years after a burial of a child under twelve years of age, unless to bury another member of the same family, in which case a layer of earth not less than one foot thick shall be left undisturbed above the previously-buried coffin. If, on reopening any grave, the soil be found to be offensive, such soil shall not be disturbed, and in no case shall human remains be removed from the grave.

In the Report of the U. S. National Board of Health, 1879, it is noted of Weehawken cemetery, Bergen Co., New Jersey: "In the dry and porous soils, from one to three years will insure complete decay. In the moist and heavy earth, a much longer period. In the cemeteries of Hudson County, New Jersey, the soil varies somewhat. The graves are dry. As to the rapidity of decay, it varies with the soil. In the tenacious and clayey portions, bodies have been exhumed after twelve years and found not completely destroyed. "In the more sandy and porous soils, three years are sufficient to reduce bodies to the condition in which they would be in clay-

moist soils in twelve years." Other testimony, and from other districts, is to the same effect. We think it may be accepted as a rule that in favorable soils—porous and well aërated—decomposition will be complete in from three to four years ; and in soils dense, clayey or wet, the putrefactive process will be delayed for from twelve to fifteen years, according to the circumstances.*

The size of grave spaces, as adopted by the British Home Office, and so prescribed, is nine feet long by four feet broad, four square yards for an adult, and for a child under twelve, two square yards, either four and a half by four feet, or six by three feet. This size, which may be recommended by sanitary authorities for general adoption, allows the retention of a strip of undisturbed ground about two feet in width between two adjacent graves. In any case it is important that each grave should be at least a foot distant from the nearest graves on every side, not only to prevent the passage of effluvia into the open grave from decomposing bodies in the

* The following was related to the writer by one of the parties concerned. A young man was instantly killed by lightning on Governor's Island, New York harbor, while at work as a carpenter. His body was brought to Orange, N. J., and buried in the parish burying-place. He was killed on the 24th of June, 1799, In the month of December, 1878—seventy-nine years afterwards—two of his nephews superintended the interment of his remains for removal to another resting place. One of them was an intelligent physician. The soil of the graveyard is a sandy loam overlying the red sandstone, which is from eight to twelve feet beneath. About a foot of gravel was found above the remains. When they were reached it was found that the coffin and everything of the body was gone except the skeleton, which was in a state of complete preservation. The bones perfectly preserved were taken out with great care and laid on the ground beside the excavation. The perfect skeleton was thus reproduced. Not a carpal or metacarpal, nor a tarsal or metatarsal bone was missing.

graves adjoining, but to avoid the danger of falls of earth when excavations are made too near to ground which has been previously disturbed.

The modes of interments in the British cemeteries are in graves, vaults and tombs. The former are in general use. Their depth varies from five to six feet, the same being prescribed by the cemetery companies, or by the authorities of the towns or cities where they are situated.* Graves are the safest place for burial, and furnish conditions for the most rapid progress of decomposition.

When vaults are used they should always be built under ground, in places well drained, and as free as possible from moisture. Bodies in vaults decompose slowly under the most favorable soil conditions. Tombs built above ground, and such as will be best adapted to preserve the air from the noxious vapors of decomposition, should be constructed with chambers in stone and masonry, and in such a manner as to be hermetically sealed with stone and cement, as they successively become occupied.

* In Greenwood Cemetery, Brooklyn, which is the largest in this country containing 450 acres, the graves are six feet deep. The soil is mostly a sandy loam and gravel. It was established in 1840. The number of interments to November, 1882, is 216,137.

In a recent medical journal, in an article on *cremation*, it is said: "It need surprise no one to learn that the exhalations of this cemetery (Greenwood) were recently complained of in South Brooklyn." This writer addressed a letter to Doctor J. H. Raymond, the intelligent Commissioner of Public Health in Brooklyn, containing the above extract, and asking if the fact therein stated was so. His reply was, "I have heard no complaints about exhalations, nor can I learn from any source that any such have been made." We notice this to correct an error, but more to illustrate the good sanitary influences of a very large, yet well regulated rural cemetery.

COFFINS FOR THE DEAD.

Coffins have been used from the earliest ages of which history or monuments furnish any memorials.

The word *coffin* is derived the Greek *kofinos*,—a basket, coffer, chest; in the ordinary English sense, a chest or box in which the dead are laid.

When Joseph died, we have the scripture record: "They embalmed him and he was put in a coffin in Egypt." This is the first and only time that the word appears in the scriptures. It was, doubtless a mark of distinguished honor to one who, by the word of Pharaoh, had so long been "ruler over all the land of Egypt."*

When Cambyses, son of Cyrus the Great, (A. C. 530,) conquered Egypt, the spies whom he sent forth to make observation of the kingdom, were permitted to see the

* It is supposed by some writers upon Egypt that the evaporation and absorption by the earth are so rapid that the Egyptians were led to adopt embalment. Herodotus says that they embalmed their dead to prevent the destruction of the bodies by worms. It came to be a custom with them, after the embalming process was completed, to enclose the bodies in a case or coffin made of paper or other fabrics, and saturated with substances for its preservation. The atmosphere of our northwestern Territories is dry to such a degree that the snows of the winter pass off from the ground without leaving it wet. A mummified buffalo was found a few years since on the plains of Colorado. An occasional specimen of an Indian mummy is to be found in our museums.

A traveler over a plain near the Soudah Mountains, in Northern Africa, observed many skeletons of animals, which had died of fatigue on the desert, and occasionally the grave of a human being. All these bodies were so dried by the heat of the sun that putrefaction appeared not to have taken place after death. In animals recently dead he could not detect the slightest offensive smell; and in those long dead, the skin with the hair on it remained unbroken and perfect, although so brittle as to break with a slight blow. *Lyell's Geology*.

coffins of the Ethiopians, which were made of crystal. The corpse was "placed in a crystal pillar, hollowed out to receive it. * * * You may see the corpse through the pillar, within which it lies." *Herod. b. iii, § 24.* This was probably glass, as it is known to have been made in Egypt 2,000 years before Christ, having been found bearing the name of a Pharaoh of the eighteenth dynasty. *Rawlinson's Notes.*

Coffins, in the modern sense, were known in Greece, composed of various materials. Those most common were of baked clay or earthenware. The coffin of the Romans was called *arca* or *loculus*, and was frequently made of stone—originally of a peculiar kind of stone, brought from Assos, in Troas, which was said to consume all the body except the teeth in a few weeks. From this fact it was called sarcophagus,—the Greek word for *flesh destroying*. They also had coffins of bricks covered with tiles; of stones, with urns, *pateræ* and lachrymatories in them. They had, also, leaden and glass coffins. Of wooden coffins, Arthur's is the oldest known instance. They frequently occur in English barrows, boxes hollowed out of the trunk of a tree. Sometimes an elm with the bark on, fastened with rivets and small strips of brass, have been found in English barrows, holding skeletons and burnt bones.

Many Roman stone coffins have been found in England. The simplest of all was that used by the British Celts and other rude nations, consisting of unhewn stones set on

their edges, so as to cover the sides and ends of the graves, one or more flat stones being then laid over the body, to form the lid. To these succeed stone coffins, used for persons of the higher classes in Saxon times and throughout the middle ages. They occur among the Anglo-Saxons so early as 695, and were not quite obsolete before the reign of Henry VIII (1509). They were generally of a single block, tapering from the upper end. In the hollow for the reception of the body was a part cut out and fitted for the head and a hole in the bottom to permit the escape of the fluids of the decomposing body. They were not buried deeply in the earth, and were frequently so near the surface that the lids were visible. If within a church the lid formed part of the pavement, and sometimes they were above the ground altogether, and thus became the originals of the Altar Tombs. Leaden coffins were occasionally used in the middle ages. *Strutt's Manners and Customs. Gough's Sepulchral Monuments. Fosbroke's Ency. of Ant.*

About the time of the Conquest, and for a century after, the usual folding of a corpse seems to have been the strongest leather, or a bull's hide. Of the fashion of the ox hide there are a great many instances. Henry I and his son Prince Henry, the Empress Maude, King John, a countess of Pembroke, James III of Scotland are recorded by Gough as wrapped in bulls' hides.*

* "From the great number of stone coffins found in this kingdom (Derbyshire, Gloucester, Nottinghamshire), it appears that formerly all persons of rank and

In the Norman dynasty, it was the custom to bury monks in the bare ground.* Abbot Waring (died 1195) ordered that they should be buried in stone coffins, as more decent. With this exception, the former custom prevailed for long after. In the time of Edward II and III, even persons of distinction preferred to have their bodies committed to the bare earth. It was a common custom in the time of Queen Elizabeth to bury only in winding sheets. There were recently to be seen at St. Albans and at Durham, the chests, with lid and hinges, which were formerly used as biers to convey those dead to the grave who had no coffin but their winding sheets. When laborers were at work in the choir of Gloucester, in 1741, during the ransacking, as it is called, of that cathedral, they found in the passage three abbots buried near the surface of the ground *in pontificalibus*, part of

dignity, of fortune and fashion, were buried in this manner. It was the custom among our Saxon ancestors. The number of the coffins found is no inconsiderable proof of it, but there is a clear instance in Ven. Bede, who, speaking of Queen Ædylthryd, or St. Awdry, that died of the pestilence in the year 669, says she was buried by her express command in a wooden coffin—*et æque, ut ipsa jusserat, non alibi quam in medio eorum juxta ordinem quo transierat ligneo in locello sepulta.*

"This implies that otherwise a person of her high birth and great dignity would have been buried in a coffin of stone. This inference is just, for it follows after, in the same author, that her sister Sexburg, who succeeded her as abbess, after the body had lain in the grave sixteen years, caused her bones to be taken up, put in a new (stone) coffin and translated to a place in the church. In more modern times their use was continued as late as the reign of Henry III; in some cases to Henry VIII." *Sam'l Pegge, in Gent. Mag., 1759.*

* In the monkish times, stone coffins were much in vogue for persons of quality. For the inferior monks, the most common way was by the winding sheet. *Notes and Queries.*

the gloves and apparel remaining. Ancient bishops of London were so found lying in their proper habits. *Ibid.*

Among the vestry minutes of St. Helen's, Bishopsgate, is the following, March 5th, 1564, proving that the custom of burials in a winding sheet had prevailed and ought to be stopped: "*Item*, That none should be buried within the church unless the dead corpse be confined in wood." *Notes and Queries.*

It was a custom observed in various parts of Christendom before and since the seventeenth century, to bury the clergy with their feet towards the *east*, that they may meet their flocks on the morning of the great day and conduct them to the tribunal. Tradition has fostered the expectation that our Lord will appear in the east. Therefore, all the faithful dead are buried with their feet to the east, to meet him. Hence, in Wales, the east wind is called the wind of the dead men's feet. This sacerdotal privilege was conferred in 1614, by a rule contained in the *Rituale Romanum*, sanctioned by Pope Paul V. *Ibid.*

In the reign of James II, a St. Clair was buried in a coffin. The usage of interring the knights of this noble family in their armor and without coffin, is referred to by Sir Walter Scott:

" Seemed all on fire that chapel proud,
Where Roslin's chiefs uncoffined lie.
Each baron, for a sable shroud,
Sheathed in his iron Panoply.

“ Seemed all on fire within, around,
 Deep sacristry and altars pale ;
 Shone every pillar foliage bound,
 And glimmered all the dead men’s mail.”

Shakespeare, in ten or twelve instances, notices coffins of wood as enclosing the honored dead.

“ Upon a wooden coffin we attend,”

says Exeter, in 1st Henry, vi : 1, 3.

Clifford, when importuned by the Earl of Rutland to spare his life, says—3d Henry, vi : 1, 3 :

“ No, if I digged up my forefather’s graves
 And hung their rotten coffins up in chains
 It could not slake mine ire.”

The very few allusions of the poet to the “ uncoffined ” dead relate to the ignoble poor and to criminal outcasts.

It would seem, from the apparently studious avoidance of any mention of coffins in the burial service of the Church of England, that at the period of the compilation of that service (1546-7), uncoffined interments were common ; *corpse*, or body, alone is spoken of. Sir Henry Spelman says in his works : “ Interments without coffins were common amongst the humbler classes even so late as the year 1650. Some decent involucra or coverings

were deemed to be necessary, but this was all.”* *Notes and Queries*.

Linen was the customary fabric for swathing the dead by those who were able to purchase. As it was imported from “beyond the seas,” an act was passed by Parliament in 18th of Charles II, “*for burying in woollen only*,” intended to lessen the importation of linen, and for the encouragement of the woollen manufacturers of the kingdom. It provided that no corpse should be buried but in woollen only; penalty, £5. A register to be kept in every parish of persons buried there, affidavit to be made within eight days after each burial that the person was buried in woollen; penalty, £5.

The very poor were sewed up in sheets and carried to the grave in a “parish shell,” which was a coarser kind of coffin with a movable lid, and used as a bier† for the purpose of conveying the body to the place of sepulture. *Fosbroke Ency. Ant.*

Interment in the bare earth was the common method among the Jews and other nations as well. Jacob was embalmed by command of Joseph, and Joseph also was embalmed. As they died in Egypt, their remains were

* In Causton, Lincolnshire, is a register, date 1707: “The parish clerk is chosen by the vicar, his salary paid as followeth, viz.: the church wardens pay him yearly for winding the clock and ringing the bell at the customary hours day and night, 17 shillings, and the constable for every passing bell, five pence. For every grave in the churchyard and without coffin, four pence; if with coffin, one shilling,” &c. *Notes and Queries*.

† *Bier* has the same root as *bear*—to carry.

thus distinguished according to the customs of the country. No other Israelite is spoken of in the old testament scripture as having been embalmed. Numerous burials are noticed, of which we have spoken before. Some were laid in tombs, but the most were buried in the earth. The body of our Saviour was wrapped in linen. The stone at the door of the sepulchre was, to the minds of the holy women, the only apprehended hindrance to their approach to his body.

Through all English history the distinguished alone, as we have seen, were laid in coffins. It is reasonable to infer that the dead bodies of the pilgrims at Plymouth, so many of whom died during the first winter, were laid in the bare earth. So immediately after the arrival of the pilgrim fathers, harassed by their various needs, destitute of sawed timber, half their number "wasting away by consumptions and lung fevers," fear of the Indians prompting them to conceal the great mortality among their little company, we cannot doubt that any other mode of burial was adopted than that to which they were accustomed in the land of their fathers. The writer has taken great pains to find records or tradition upon this subject among the old towns of Massachusetts and on Long Island, but thus far without success. In Doctor Samuel A. Green's "Early Records of Groton, Mass.," are the items of a town clerk's funeral expenses, February, 170 $\frac{3}{4}$. They are: "A winding sheet, 18 shillings; coffin, 10s.; grave digging, 7s., 6d.;" &c. In the Massachusetts

Historical Society collections are some nails from the coffins of Roger Williams and of his wife. The coffins were wholly decayed except a few fragments. Williams died in April, 1683.

Burial in coffins, as a universal custom, commenced with the last century. *Fosbroke's Ency. Ant.*

A reverent respect for the dead and the purest sentiments of affection are in harmony with the method of depositing, in proper swathing, in mother earth, the bodies of those who "return to their dust." It hastens the inevitable decay, and thus protects the living. A burial at sea without a coffin is accepted as proper, and is not esteemed to be abhorrent to surviving friends.

Some years ago Mr. Francis Seymour Haden, an eminent surgeon, wrote a series of letters to the *London Times*, in which he very forcibly showed that the solid coffin is a source of evil, and that burial in it was dishonoring to the dead and fatal to the living. He pointed out the distinction between *effective* and *non-effective* inhumation, and that the former could not be obtained in heavy oak or other wooden coffins. The result of his teachings upon the subject has been the introduction into England of the "Earth to Earth" coffin, constructed of perishable material, as pulp or wicker-work, but with the necessary strength and solidity, and with the general appearance of an ordinary coffin. A casket such as this meets the requisites of inhumation and does no violence to our

present burial associations. Their introduction into our own country would, if they were understood, be attended with the popular favor.

The treatment of a corpse before burial is a subject worthy of the careful and studious consideration of undertakers for the prevention of the spread and fatality of disease. It is a part of their office to enforce the strictest rules of cleanliness and disinfection. "The Jewish mode of sanitation, as revealed in scripture and as illustrated in profane history, is well worthy of note as an example. Immediately after death the body was well washed, generally with a strong solution of native carbonate of soda. It was then anointed all over with some fragrant oil. Most of the essential oils have disinfectant properties. In some cases, as in scarlet fever for instance, oil serves a valuable purpose in preventing particles from the skin from floating in the atmosphere. 'Oil or vaseline can be used still with advantage.'" *Dr. Hunt, 3d An. Rep. State B. of H., N. J.*

The interval of time between death and burial varies somewhat according to the custom of neighborhoods and classes of people. "When thou hast wept awhile," says Jeremy Taylor, "compose the body to burial; which, that it may be done gravely, decently and charitably, we have examples of all nations to engage us, and of all ages of the world to warrant. So that it is against common

honesty and public fame and reputation not to do this office." Impressed with such sentiments, we should pay our tribute of love and respect to the dead.

The stages of decomposition which are the most dangerous are, that which takes place immediately after death, and the extreme degree of putrefaction. Among the poorer classes who live in very limited, ill-ventilated quarters, the corpse frequently occupies the bed where the previous sickness and death have occurred. Its emanations, and those of the sordes, infect the air. Here the members of the family eat and drink, and work and sleep. Thence go forth, in neglected neighborhoods, infection and contagion to do their fatal work. The custom among a portion of our foreign population of waking the dead is attended with serious danger, and becomes the frequent occasion of transporting the contagion of disease in a degree corresponding to the numbers of those partaking in it. While preparing this manuscript, its writer has found it to be his duty to warn one of his own household, and forbid attendance at the wake of a child who had died of scarlet fever.

COUNTRY GRAVEYARDS.

We have considered the subject of rural cemeteries—their comparative safety and the best methods of management to preserve the public health. These are, for the most part, established, for our cities and larger towns.

A graveyard in the country is not usually deemed to be a source of infection or a means of deterioration of the air. In many cases it is not ; but the facts which have been presented in this treatise have a logic in them which cannot, with a wise regard to the health of a town, be overlooked or disregarded. In the Report of the Board of Health of New Jersey, 1880, we find the following from a writer in the northern part of the State: " Another great nuisance in some parts of the country is the graveyard or burying-ground ; such a one we have in the village of ———, in the shape of a graveyard. It is in the centre of the village, and on the elevated side of the street. The church is in the graveyard. Private dwelling houses are situated on the lower, or other side, of the street. Each house has a well of water for family use. The water runs from the graveyard into these wells. I have heard one old sexton of this church tell me a number of times, that when graves were dug in certain parts of the yard the wells of water would become roiled and muddled during the process of digging. The children of the Sunday school drink out of these wells, and the children of the public school in the place patronize them, as the school has no well of its own ; and if it had, the school-house is situated at the lower end of the graveyard. This graveyard is a confirmed nuisance. It is an old yard, and the community still bury in it. The land is wet and soggy in the yard. There are a number of good locations within a quarter to half a mile from

the village for a cemetery; soil dry and pleasant. I urge strongly on the State Board of Health that the matter be looked into, and, if I am correct, that an act of the Legislature be passed preventing any more burials taking place in this graveyard."

Another writer from another county in New Jersey remarks that burial-grounds are mostly connected with churches, and raises the question whether churches which are closely crowded upon by graves, and not occupied during the week, do not become receptacles of graveyard air, and thus risk the health of the Sabbath worshipers, especially in those churches heated by furnaces, which cause a current of air from without laden with noxious gases.

In the case of the graveyard first noticed, the "wet and soggy ground" retards indefinitely the natural decay of the bodies buried in it, and the specific germs of malignant fevers—cholera, diphtheria, etc.,—are liable to find their way into the wells. As may have been the case here, a place of burial in the country is not infrequently a gift, or is purchased because it is *cheap*, being unfit for cultivation. If an endemic of fatal disease invades, it is accepted as a visitation of God, and not as a judgment upon the people who do violence to His laws. All our country towns are subject, in a greater or less degree, to the more common forms of epidemic disease. We will not venture the assertion that they have their cause in the graveyard; it cannot be questioned, how-

ever, that it may, by its emanations and the pollution of the water, intensify prevalent disease, increase its infectious power, and convert a mild into a widely-fatal epidemic.

The country towns in the vicinity of our great cities have become suburban ; small villages have become considerable cities. Their population, as it increases, crowds upon the old and venerated burying-places, and they are enlarged to meet their increasing interments. The authorities of such towns are stimulated by their growth to add to their attractions by improvements in drainage, by abating nuisances and by conveniences of various sorts ; but when, as has occurred in some towns, they are warned of the dangers of the graveyards, and importuned to abate them, they let them alone to receive their annually increasing dead, to exhale their noxious miasm, to pollute the water supply, and to become nuisances of a daily increasing power for evil.

The most of the governments in Europe have prohibited intra-mural interments absolutely. In our own country the disposal of the dead has not been a subject of *legislation by State legislators*, to whom it belongs. The regulation of burials has been left to municipal authority, liable to be governed in its action by local influences.

The question how and where the dead shall be disposed of is one eminently sanitary. It is a civil affair. The religion of all peoples modifies and renders traditionally

sacred their methods of burial; but among Christian nations "such is the harmony always existing between religion and sound policy, that what is acknowledged as decorous and useful by one is also commanded and prescribed by the other."* The dead should be so buried that *the living may not suffer*. The Legislatures of our States adopt laws of quarantine to protect the people from the importation and consequent spread of contagion. The State of New Jersey, perhaps others, provides by a general law against the infection of cattle. Our law-makers do not recognize as they should, the fearful dangers of the inhumation of human bodies, dead from malignant disease with its specific germs—germs which float in the air we breathe, and the water we drink; germs which neither boiling nor freezing can destroy; germs which, after being buried in the earth for centuries, when brought to the surface by excavations produce a pestilence, and which, like vegetable seed germs buried for ages in the earth, when brought to the surface, bring forth fruit, each after its kind.†

* Ordinance of Archbishop of Toulouse, forbidding interments in churches, and enacted by the State (1765).

† Numerous instances are on record where seeds have grown which have lain dormant for ages. Their vitality seems to be imperishable, while they remain in situations in which nature has deposited them. When a forest old enough to have witnessed the mysteries of the Druids is felled, trees of other species spring in their place, and when they in their turn fall before the axe, the germs which their predecessors have shed, perhaps centuries before, sprout up and restore the original growth.

Earth brought up from wells and other excavations in primitive soil, soon

The disposal of the dead by cremation or by chemical destruction, has not been considered in this treatise. Each method, like the slower processes of decomposition in the earth, resolves the body into its original elements. If good hygiene made it necessary, the former methods would doubtless, be accepted as reasonable and proper. In our own country the question of their adoption upon sanitary grounds is not an urgent one. It may become so in the generations to come. Inhumation commends itself to the traditional sentiments of the people, and an innovation upon these is not demanded.

Rural cemeteries, properly regulated, under wise control, guarded by good laws, and permanently extra-mural, afford all necessary protection to the public health.

produce plants unlike those of the local *flora*, and in some cases species entirely new. *Earth and Man*, by Geo. P. Marsh.

In Modena, Italy, excavations made through a part of the city where the victims of the plague were buried 300 hundred years before, caused an immediate outbreak of the disease in the neighborhood.

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